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Rock Products

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Chicago, September 14, 1929 (*Issued Every Other Week*) Volume XXXII, No. 19

MEMORANDUM
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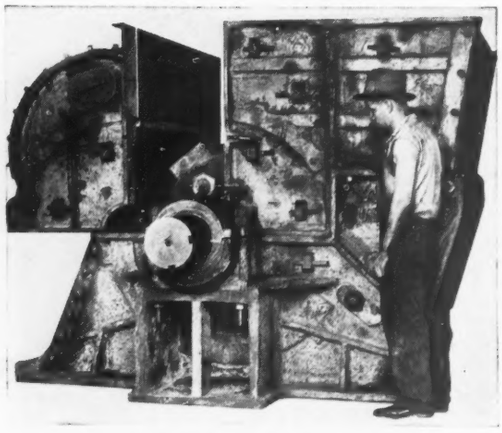
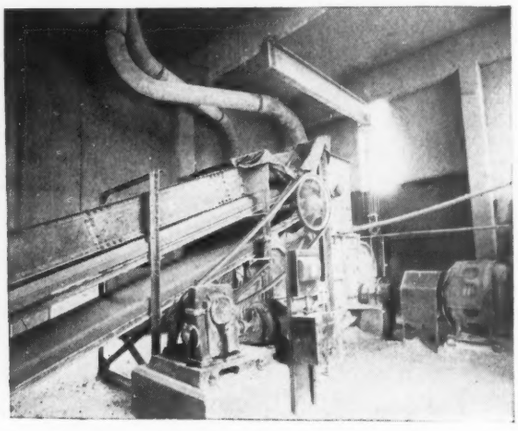


Williams "SUPER-Jumbo" with rear half of split cover moved back giving easy access to interior.



Williams No. 8 "SUPER-Jumbo" with direct motor drive and apron pan feeder at new Lawrence Portland Cement Co., plant, Thomaston, Maine.

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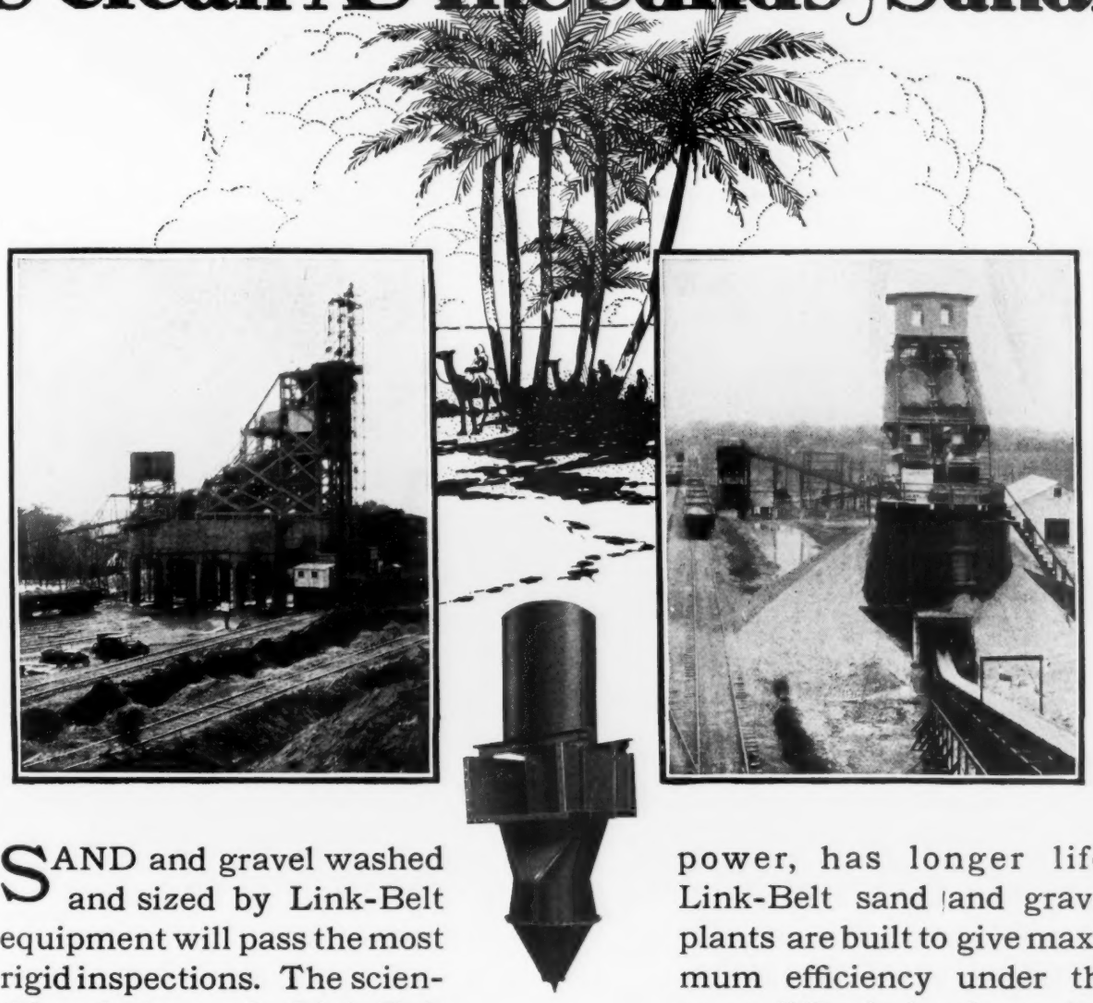

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Contents for September 14, 1929

Controlled Concrete by Designed Aggregate Mixes 41-43
By Stanley M. Hands.
The Association of Superintendents of the Connecicut Quarries Co. 44-46
A rather unique institution from more angles than one. By N. C. Rockwood
Making Sand and Gravel Down in "Ole Alabam" 48-49
Southern Sand and Gravel Co.'s operation described by a sand and gravel poet. By R. C. Butler.
Grindability of Portland Cement Clinker 50-52
A study of the grindability and quality of portland cement clinker that has been air-cooled, and clinker that has been cooled by quenching in water. By Alton J. Blank.
Feldspar Mining in North Carolina 53-56
By H. J. Bryson.
Screening Practice in England 57-59
Results of an interesting series of experiments with rotary screens. By A. S. D Crone.
Industrial Measurements 60-63
Weighing. By E. P. Partridge.
Rock Products Developments in a Seldom Explored Territory 64-67
Items of interest between Denver, Colo., and Los Angeles, Calif., in the states of Idaho, Utah and Nevada. By W. B. Lenhart.
The A. S. T. M. Symposium on Concrete Aggregates Reviewed 68-71
A digest for the aggregate producer. By Edmund Shaw.
The Determination of Iron Oxide in the Cement Mill Laboratory 72-73
By Robert M. King.
Use of Lime in the Food Industries 81-82
By Alfred B. Searle.
First Aid Training Proves Big Help 85-87

Departments

Hints and Helps for Superintendents 74, 75
Editorial Comment 77
Financial News and Comment 78-80
Foreign Abstracts and Patent Review 90, 91
Traffic and Transportation News 92, 93
News of the Industries 94-99, 109
Current Prices of Rock Products 100-104
Cement Products 105-108
New Machinery and Equipment 110, 111
News of All the Industry 112, 114
Classified Index of Advertisers 120-126

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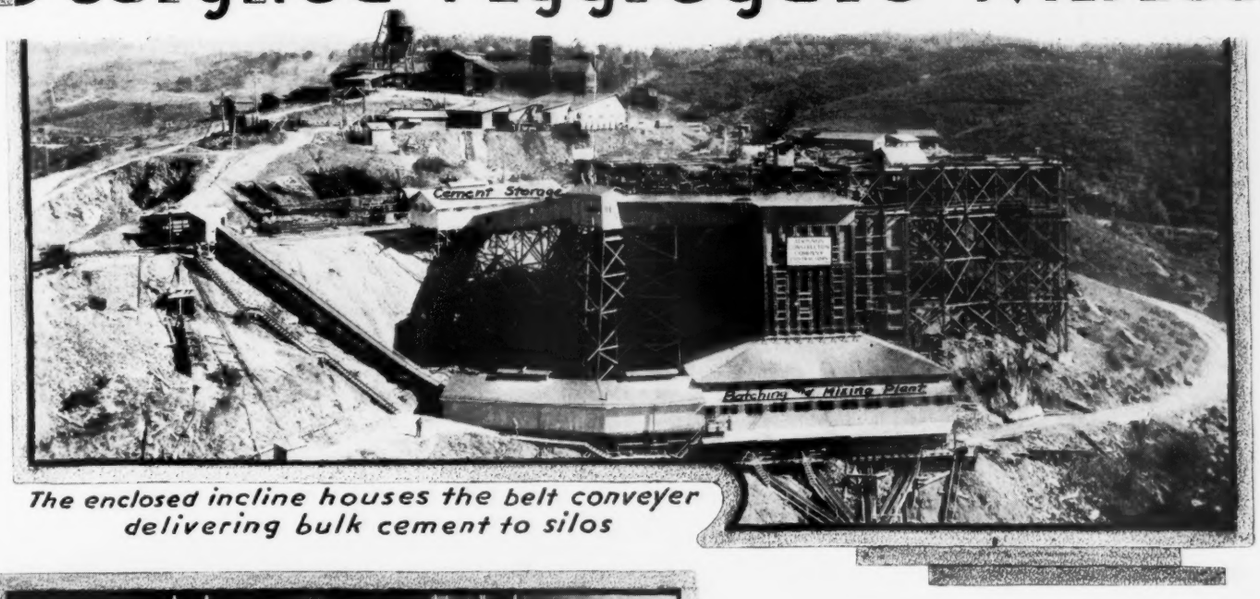
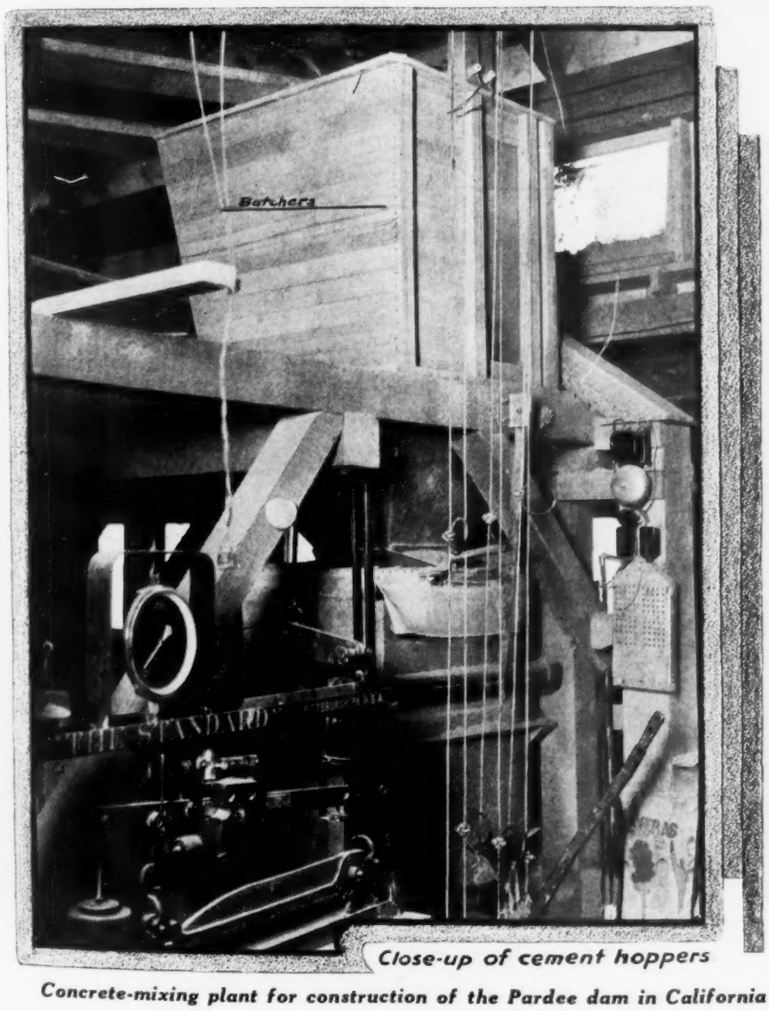
Controlled Concrete By Designed Aggregate Mixes



The enclosed incline houses the belt conveyer delivering bulk cement to silos



Close-up of cement hoppers

Concrete-mixing plant for construction of the Pardee dam in California

CONCRETE, according to one authority*: "Portland cement cannot escape the laws of nature, and the products made therefrom can hardly be expected to withstand where even the hardest rocks are being attacked; all that can reasonably be expected is that its products will approach the natural rocks, such as granite, in permanence. The credit for making permanent concrete products must go to the engineer, and to the contractor and his organization, as well as to the cement manufacturer. The choice of an aggregate of suitable physical properties and grading is extremely important, as is the method of application in making the concrete, while the cement, by binding the whole together, fulfills a very important function. If the binder fails, the whole concrete fails; if the improper aggregates are chosen, the best cement and the best manipulation can hardly be expected to make good concrete; the best of materials may be mishandled.

Some one must take the responsibility for the finished product. In the case described on the following pages the contractor did, not only by placing the concrete but by producing and preparing the aggregates. And he prepared and used the aggregates so that there was no waste. Occasionally there is something to be learned from a temporary, contractor's, gravel operation; and when such is the case we intend to use the material, in spite of the fact that this is a 100% commercial producers' medium. The author is a former commercial producer in Iowa.

*F. O. Anderegg, Senior Industrial Fellow, Atlas Portland Cement Co.'s Industrial Fellowship, Mellon Institute of Industrial Research, Pittsburgh, Penn., in a paper "The Mechanism of Corrosion of Portland Cement Concrete, with Special Reference to the Role of Crystal Pressure," American Concrete Institute, 1929.

Controlled Concrete By Designed Aggregate Mixes

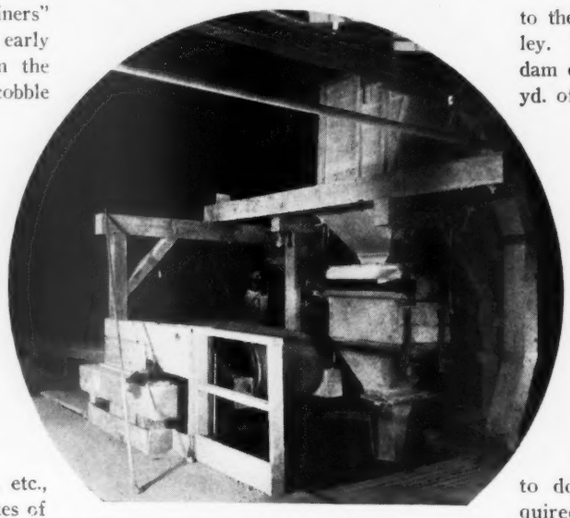
By Stanley M. Hands

GOLD BEARING deposits of sand and gravel along the Mokelumne river are the source of supply of concrete aggregates used by the Atkinson Construction Co. in the construction of the Pardee dam. These deposits have an interesting place in the early history of California, for the "Forty-Niners" panned them originally. Following the early panner came the Chinaman, and then the dredge. The last left windrows of cobble and gravel at the surface, under which lies the sand which had once been passed through the dredge's gold extracting process and dumped backward into the deposit.

An interesting sidelight to the production of concrete aggregate is the operation of the sluices between the screens and the sand classifiers. This part of the operation is in charge of "Gold Dust" Smith, an old-timer in the hills, and often produces real money in the form of gold coins, lodge pins, etc., which the dredges had missed. The dates of 1832, 1849 and 1852 indicate that they were probably lost by the early workers of the deposits. One Masonic pin which was found clearly showed that it had been hammered out and finished with a file, the marks of which were noticeable on the back side. These relics are disposed of at the private auction conducted at the camp office once each month. Those permitted to bid are "Gold Dust" Smith and the firm members, Lyn Atkinson, Guy Atkinson and W. A. Kettlewell.

The Pardee dam, constructed by the Atkinson Construction Co. for the East Bay Utilities Co., will furnish power and water

Sand and gravel plant for furnishing aggregates for the Pardee dam in California



Aggregates are batched from storage into batchers and the batchers discharge on to the belt, which delivers it to the mixers

to the districts around Oakland and Berkeley. The design is a typical mass concrete dam consisting of approximately 650,000 cu. yd. of concrete, and when finished will represent an investment slightly under $10,000,000.

The concrete aggregate is produced from the deposit in the following manner: A 4-yd. Monighan dragline digs the material from the deposit and loads the seven 20-yd. standard-gage Western air-dump cars. Three trains, pulled by a 25-ton Plymouth gas locomotive, haul the material to the conveyor pit at the plant. A Pauling and Harnischfeger 208 dragline is held as a reserve loading unit and to do loading when big capacity is required.

The sand and gravel screening, crushing and washing plant has a capacity of 225 tons per hour, and was designed and erected

by the Bodison Manufacturing Co. of San Francisco at a cost of $250,000. The material in the pit is fed on to a belt conveyor and carried to a scrubber using 1000 cu. ft. of water per min. The gravel passes through the typical screening and washing, the oversize to a 28x36 Traylor jaw crusher and the sand over the gold extracting sluices to the classifiers.

The separation is maintained throughout and the various sizes are delivered to ground storage under which a conveyor operates through a tunnel and delivers the sized material to the loading bunkers as required.

A Bleichert aerial tramway, four miles long, conveys the aggregates over the hills to the concrete mixing plant at the dam site. This operation is nearly perfect, and it requires very little attention either in operation or upkeep. The towers vary but little in height, but the spans vary up to 1600 ft. There are 205 buckets traveling 400 ft. per min., giving a capacity of 225 tons per hour. Since this tram is the neck of the bottle, it must operate day and night to keep the mixing plant supplied with aggregate. An aggregate storage of 6000 tons is maintained above the mixing plant to provide for the peak demands.

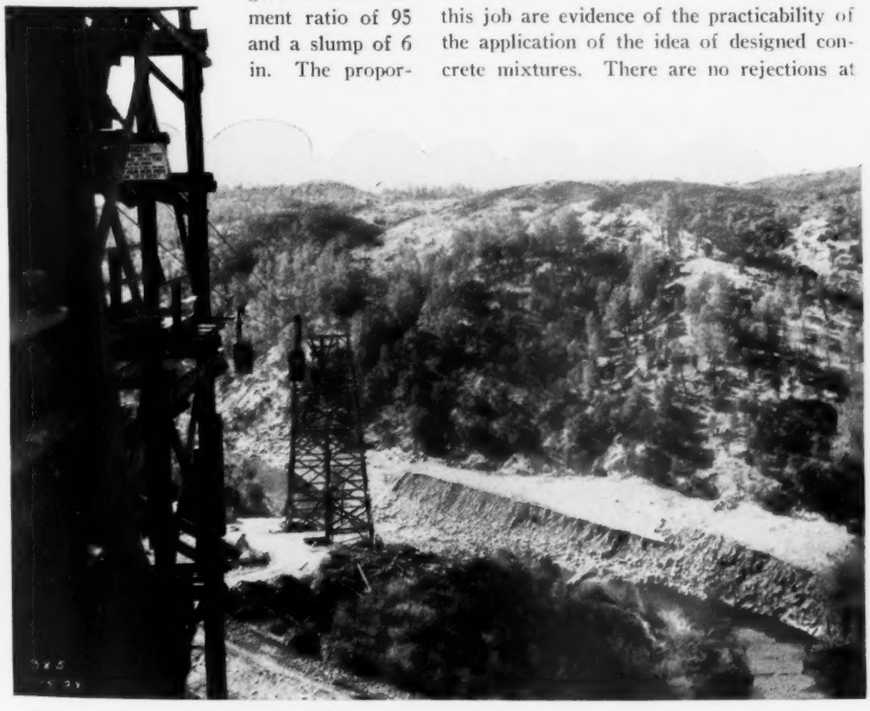
The concrete aggregate is proportioned according to grading characteristics to give 1500-lb. concrete. Samples are tested and results show the concrete to be above the requirements. Concrete proportions are under the supervision of L. T. Tuthill, resident concrete technologist for the East Bay Municipal Utilities district. Mixtures of sand, gravel and 3- to 6-in. cobbles are determined and changed throughout the day to give a water-cement ratio of 95 and a slump of 6 in. The proportions average 1 bbl. of cement per cu. yd. of concrete (0.95 bbl. for a 1:6.9 mix and 1.05 for a 1:6.3 mix). The concrete is readily workable and flows through the chutes without separation or floating water. Ninety-day tests on concrete show an average strength of 2376 lb. per sq. in.

Building farthest away is point at which the aerial tram buckets are loaded; buckets are dispatched by a time clock, regulator and make a round trip in 80 min.

The methods of concrete mixing used on this job are evidence of the practicability of the application of the idea of designed concrete mixtures. There are no rejections at the gravel plant, and almost 100% of the material dug from the deposit is used. Seven different washing operations using 3000 c.f.m. of water assure the engineer of a clean product. The variation in the gradation characteristics of the material is remedied by the delivery into the storage bunkers of the different sizes separately. Any surplus of sizes in the deposit is noted by the piling up of the storage at the gravel plant or by accumulation of that size in the compartment at the mixing plant. These accumulations are quickly reduced to normal by redesigning the concrete mixture.

The proportions are by volume and are made with Blaw-Knox batchers delivering each size in the right quantities to a belt conveyor feeding the mixer hopper. The cement is measured by weight with Fairbanks-Morse hopper scales served by screw conveyors placed under the cement silos.

Lyn Atkinson, Guy Atkinson and W. A. Kettlewell invested $1,250,000 in equipment for building this dam. Designed concrete, under Mr. Tuthill's supervision, has eliminated problems that otherwise would be added under any other method of proportioning. Here is a practical demonstration of the idea that good concrete can be made from aggregates showing different grading characteristics. There is no waste in this operation, nor is there any additional expense placed upon the contractors. No better proof of the economies of concrete and production of concrete aggregates could be given than is this job. It is hoped that engineers and architects will eventually apply these methods.



Four-mile cable tram from gravel pit. The buckets come in here and go around the loop over the storage bins; they are tripped and unloaded without stopping

The Association of Superintendents of the Connecticut Quarries Co.

A Rather Unique Institution from More Angles Than One

By Nathan C. Rockwood
Editor-Manager, Rock Products

THIS SUMMER, for the first time in several years, the writer had an opportunity to revisit familiar places in the East—New England particularly. Like many other native New Englanders who have "emigrated" to other sections of the country, while always retaining a sentimental attachment for New England, it has been generally regarded as unprogressive, or at least ultra-conservative. It certainly is not, so far as certain rock products industries are concerned, because within a few miles of my boyhood home I discovered the most progressive, and perhaps unique, institution in the rock products industry—the Association of Superintendents of the Connecticut Quarries Co., New Haven, Conn.

To begin with, it is not wholly a superintendents' association, for a few foremen, the master mechanic, the time keepers, and the salesmen, including the general sales manager, are members also. It would perhaps be more properly termed "the company's key men's association," for by design or otherwise it really does include about all the key men in the organization. Now, of course, this is not the first superintendents' organization, either in the rock products industry or outside of it. But all such organizations that we have heard of hitherto have been fathered and promoted by higher company executives. This Connecticut company's association was entirely voluntary on the part of the superintendents themselves, indeed the germ of it was hatched and developed in the mind of one of these superintendents. At the beginning he met with discouragement from the company executives. The general manager did not see where such an organization could find anything to do.

Incidentally, I attended one of the monthly meetings of the association. The entire session was serious, business-like and snappy. Production and cost figures were frankly discussed and various proposals to promote the company's business were made and freely discussed. I can honestly say that I have attended many meetings and executive sessions of business executives who carry far more managerial responsibilities than these men, which were not nearly as business-like, and where discussion was not more to the point and as frank and honest.

Objectives

The curse of nearly all business organizations (and of society as well!) as nearly every one knows, is jealousy. It is human nature—in spite of 1900 years of Christianity—to look out for No. 1 first, last and all the time; and looking after No. 1 of course naturally tends to jealousy of the accomplishments and progress of our competitors—in the economic sense that all we come in contact with are competitors for the necessities and luxuries of life. Thus in any organization of more or less independent producing or managerial units it has always seemed that a certain amount of jealousy is inevitable—it may be termed rivalry or competition, and possibly may be turned to the advantage of the company on occasion; but, as business executives are now preaching to one another, "co-operation is better than unbridled competition." It is better to have teamwork and genuine, sympathetic co-operation and friendliness within an organization than jealous competition.

Doubtless such jealousy as is common to all organizations of human beings is more apparent to superintendents and foremen because they are closer to human nature than are higher executives, who, if they are good executives, have largely outgrown such feelings themselves, and are not especially looking for them in others. They know that the first law of compensation is that you must give before you receive; and they are executives because they have learned to give.

A Very Human Document

What follows is rather personal, and we fear may be, at first blush, distasteful to the principals involved; but we could not tell our story adequately without the background. As I noted before the organization was apparently largely conceived in the mind of one of the superintendents, and if we are to judge by the usual experience of promoters of organizations of any kind, he both anticipated and received the usual measure of initial indifference. Therefore his angle of appeal to his brother superintendents is really the kernel of the spirit of whole organization. (This was borrowed from the author after use of much persuasion). His call for the organization, in his own language was as follows (probably this will be the first time the general manager has had an opportunity to read it):

"We all know the general manager, at least most of us do, and give him the consideration that our consciences dictate to an extent—that extent being limited to our interest and knowledge of progressive methods and our initiative, to conceive and create ideas and to make use of the ideas and material of proven values.

"I say we know Mr. Worthen, his disposition, his personality and characteristics, and, knowing him as we do, where is the man who would not do anything in his power to assist him?

* * * * *

[The best parts are omitted as a bit too personal.—EDITOR.]

"When one stops to think of the wonderful organization that Mr. Worthen has built up with men, most of whom have had very limited education, it does seem as though we should make a personal effort to better acquaint ourselves with ideas and methods that will prove our interest and appreciation for what consideration he has given us and double our efforts for his success, because his success is ours, and is his reward.

"I cannot see how we fellows can learn to know each other or form any kind of lasting friendship when we meet each other but once a year, or when telephoning for something when in trouble. All that one knows of the other is what someone has told him, and usually it is someone who has been employed by another and has been discharged for some good reason.

"We should create a spirit of friendship wherein harmony will prevail. This idea incorporated with one's labor is a proposition that has been seemingly omitted. There has been a lack of sociability and pleasure in performing one's duties.

"We are all fellows who work and hope for success. We are making an extra effort to attain that success by co-operating and helping each other for the success of the company and for ourselves. No man ever gets anywhere unless he honestly believes that the job he is doing is worth while.

"He can't fool himself about this; the conviction must be deep and fast. A good many men fail in business because they never quite grasp the idea that production

and trade are essential to worth-while activities. The suspicion lurks in their minds that the cause of civilization is better served by composers, lawyers and doctors. Such doubt is deadening. Unless the mind can be cleared and aired, the owner would better quit his job and apply his energy elsewhere.

"Strong men move on from success to success with their ideals, and perceive a meaning in their day's work. The attempt to glorify the business career smacks of "hokum" to many, but if idealism must be handled as "bunk" then the world is in a sorry plight, and a new kind of men must take charge of affairs. We expect civilized men to have a sense of humor and a sense of proportion, but swearing and sarcasm is the resort of disappointed failures. The development of natural resources, the conversion of raw materials into useful products, and the transportation of men and materials to places where they are needed are work of prime importance. The business career rests on a foundation of solid usefulness, and it is probably because American public opinion has recognized this, that our nation is now enjoying a standard of living superior to any ever known in this world.

"At one time 'research' was a fine word. The dictionary says it is 'diligent, protracted investigation, especially for the purpose of adding to human knowledge, studious inquiry. May we not do this? In late years the word has come into such slovenly use that the simplest inquiry is referred to as 'research.' Is this activity adding anything to human knowledge, or is it just a lot of buncombe perpetuated by jobholders in the interest of meal tickets? In modern business we find that helping the other fellow is one of the best ways of helping one's self. The consequence is that an educational campaign is being conducted by the prosperous units of industry. Most of us are looking for good reasons for buying many things we do not own, and when we have made a purchase under emotional excitement, we later look for reasons to justify our impulse.

"Civilization progresses at just about the rate at which mankind abandons superstition in favor of thinking. It should follow that the greatest servants of mankind are those who teach other men to abandon blind fears of superstition and to seek natural causes of natural phenomenon.

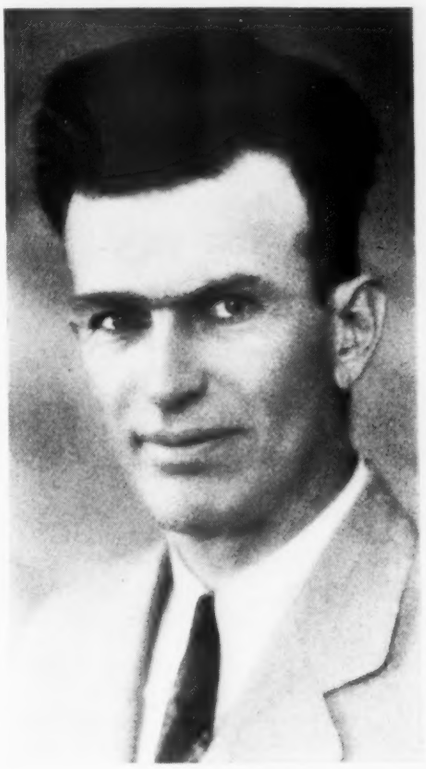
"Each of us thinks his own troubles with life and labor are distinctly peculiar to himself and only by questioning friends do we discover that they are universal.

"The public likes Babe Ruth because he wallops out home runs. He hits the ball so far that he can walk home. Ruth works easily. No worry, no fuss, no little tricks to mar his work. It is clear, spontaneous and joyous.

"Within a month after a young woman swam the English channel, four or five others performed the feat. Why can't we establish a record? Until Ruth showed that it was possible to knock out 59 home runs, all players were satisfied with 15 or 20.

"When a man has an ideal, which is another way of saying, 'He knows what he wants,' no sacrifice will be too great to deter him from the joy of attaining that ideal.

"Men should know that they cannot advance themselves in a modern business institution by plotting against, or feeling mean or ugly towards their fellow workers above or below them. They cannot advance by committing acts against that business or by retaliation. Such a course is about as foolish as fighting with others in the same dinkey in an effort to get somewhere sooner.



F. H. Edwards

"As individuals and employes, we are equally blind to unexploited equities within ourselves. Books and magazines can be purchased at trifling sums that contain information, which if used would double our incomes and make us better qualified to attain the success that we feel should be ours."

The author of that essay is F. H. Edwards, former master mechanic and now general superintendent. We will let any reader judge for himself whether it would not be a credit to any man—philosopher, scholar or whatnot? It is all the more interesting, valuable and forceful because it is the result of experience and observation and not mere theory or doctrine. As a single example of the kind of experience that led to his reasoning and the foregoing pithy exposition of it, Mr. Edwards cited to the writer some of his trials and tribulations as the company's master mechanic, charged with keeping the equipment running. When he needed repair parts he knew existed in some of the plants he found the plant superintendents, ever jealous of the well-being of their own plants, somewhat reluctant to help out. Instead of sending their best, quite naturally, they were more inclined to send their worst. They might need the good things themselves some day—and judging others by their own feeling and attitude it would be a case of "try and get it."

Mr. Edwards also furnished the following synopsis of the objectives of the organization as originally conceived by him:

"Its Object: To create interest—to promote the successful operation of quarries, by progressive methods and suggestions from actual experiences.

"Its Purpose: Increased production at minimum cost—ultimate compensation.

"A Desire: To attain success in business and its pleasure as conceived.

"Procedure: As determined after explanation with due consideration to remarks as noted.

"Establish: Spirit of friendship other than purely business—know each other—co-operation—be guided by the experiences and success of others.

Time: Once monthly or oftener if necessary or desired.

"Place: City or town in which superintendents reside, alternating.

"Order of meetings: Officers' duties. Committees' duties: Each superintendent to be committee of one to arrange with for place, lunch, sport or entertainment.

"Talks: By superintendents or representatives of concerns manufacturing materials, educational, notation of talks, operation, classification of subjects—points of interest, subjects pertaining to all—

Introduction of clerks—foremen—engineers—shovel operators—annual outing—promotion as interested—attention—care—cleanliness—order—maintenance."

Constitution and By-laws

And now may we present the constitution and by-laws:

BY-LAWS OF ASSOCIATION OF SUPERINTENDENTS, CONNECTICUT QUARRY CO., INC., AS ADOPTED ON MARCH 26, 1929

ARTICLE I

The name shall be The Association of Superintendents of The Connecticut Quarries Company, Inc.

ARTICLE II

The object: To form an association for the purpose of creating a spirit of social relationship, harmony and co-operation, with educational features pertaining to the trap rock industry that are so seemingly necessary to make for real progressiveness and mutual understanding.

ARTICLE III

Memberships, which are entirely voluntary, shall be open to all executives of The

Connecticut Quarries Company, Inc., and The Certified Sand Company (a subsidiary). The Executive Committee determines who and who is not eligible for membership.

Honorary members are elected by the Association and entitled to all privileges of active members with exemption from dues.

ARTICLE IV

The amount of dues and assessments of the Association shall be determined by vote of a majority from time to time and shall be collected from those members present at each monthly meeting by the Secretary who shall turn such over to the Treasurer. All disbursements shall be made through the Treasurer and must previously be authorized by the Association before paid except for expenses incidental to meetings and miscellaneous unforseen necessary expenses up to and not to exceed twenty dollars in total which expenses may be incurred by the Treasurer and, upon presentation to the Association, accepted.

ARTICLE V

Meetings shall be held on the last Tuesday of each month unless otherwise voted at the previous meeting.

Special meetings may be called by the President upon one week's written notice, or by the Secretary at the written request of two-thirds of the membership.

The Secretary shall notify the members at least five days in advance of all meetings as to the time and place.

ARTICLE VI

The officers of the Association shall consist of President, Vice-President, Secretary and Treasurer, with customary duties unless otherwise noted in By-Laws.

ARTICLE VII

Candidates for offices shall be selected by the Executive Committee before the last regular meeting in December, and such nominations announced by such Committee at the last regular meeting in December. Nominations from the floor may then be presented. All voting must be done by written ballots except in case of only one nominee. Officers elected take office at the first regular or special meeting in January.

If any member of the Executive Committee shall be elected to office his position upon such Committee shall be filled by voting as under Article VIII.

ARTICLE VIII

All Committees are to be appointed by the President unless otherwise voted, and to hold office for the term of the President only unless reappointed except the two following Committees.

(a) Accident Committee: The Chairman of the Accident Committee shall be appointed by the General Manager of The Connecticut Quarries Company, Inc., and all other members of the Committee by the appointed chairman.

(b) The Executive Committee: Shall consist of three members as follows:

1. The General Manager of The Connecticut Quarries Company, Inc.

2. Members elected from Superintendents or Timekeepers by the vote of the Superintendents and Timekeepers.

3. Member elected from the Bins, Sales or Office by the vote of the Bins, Superintendents, Salesmen and Office help.

Such Committees may select their own chairman.

ARTICLE IX

For voting purposes two-thirds of the total membership at any regular or authorized special meeting shall constitute a quorum.

A majority of votes at any meeting governs, except any amendments to the By-Laws which must be proposed at one meeting and tabled until the following meeting at which time a majority of the meeting rules. The President casts a vote only in case of tie.

ARTICLE X

The order of business at meetings shall be:

1. Roll call.
2. Reading minutes of last meeting.
3. Reports of Secretary and Treasurer.
4. Report of Executive Committee.
5. Report of Accident Committee.
6. Report of other Committees.
7. Unfinished business.
8. Remarks by General Manager of The Connecticut Quarries Company, Inc.
9. Remarks by Sales Manager.
10. Remarks by General Superintendent.
11. New business.
12. Speakers.
13. Adjourment.

A feature of the association that has proved very pleasant and profitable in making real friends is an annual summer outing, clam bake, etc., for members and all the members' families. These are held on Sunday so as not to interfere with the work.

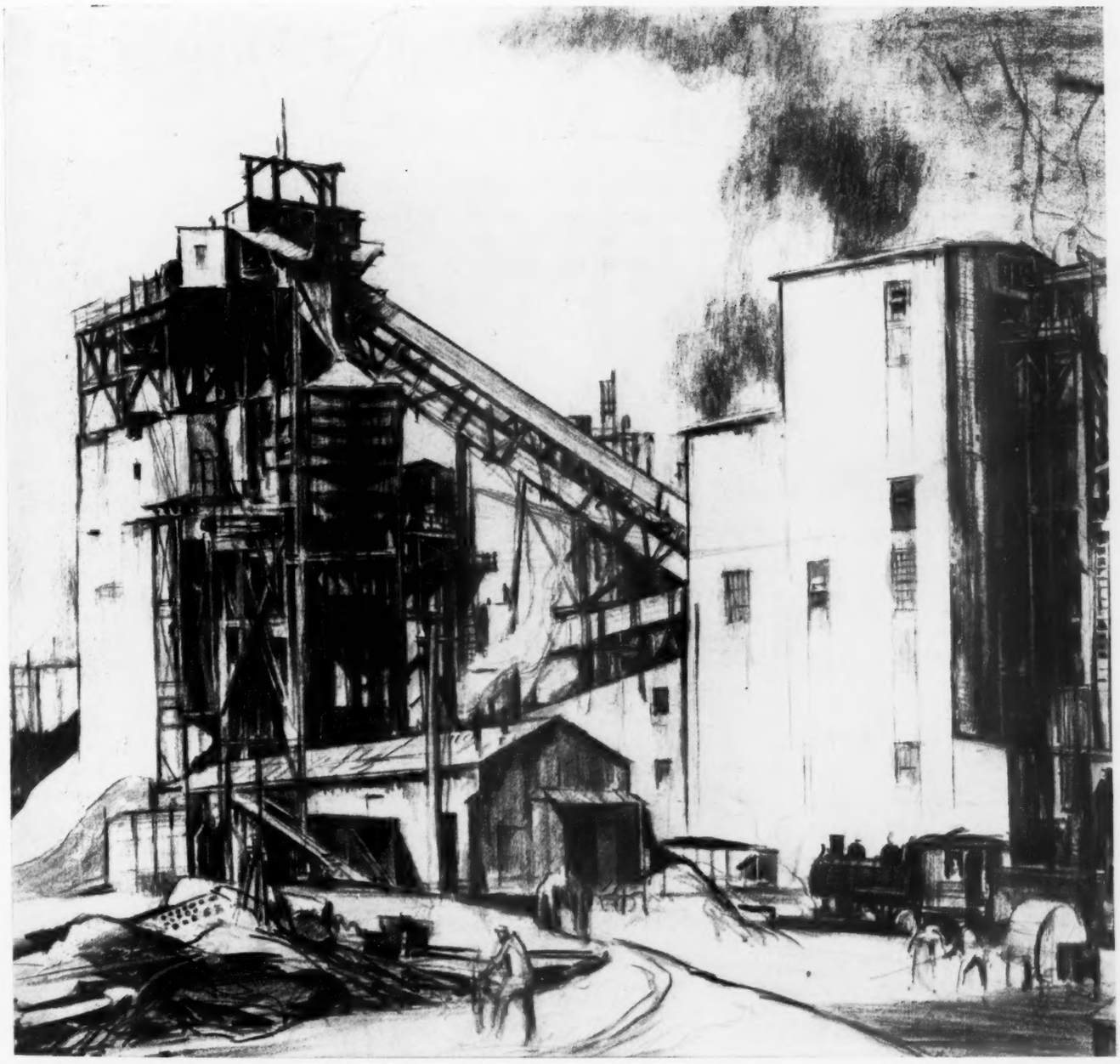
F. H. Edwards, who, we assume, took the initiative in organizing the association, was its first president. He served two terms and now enjoys the distinction of being its only past-president. F. B. Kimball, superintendent of the Wallingford plant, is now president. Robert S. Rose, superintendent of the Mt. Carmel plant is secretary.

Among other laudable objects of the association has been agitation and sacrifice to have at least one delegate from its membership attend the annual conventions of the National Crushed Stone Association, and bring back a report of what he heard and saw. For this purpose the superintendents have used their own association's surplus funds, and their combined influence with the company management. A letter written by the association's first president setting forth reasons why the superintendents should attend these conventions is as much a masterpiece as the one already quoted—it was my pleasure and privilege to read it, and I would have liked to reproduce it! As the plans have worked out they all went to the 1929 convention.

Since the association has become established and proved its worth it has received financial support from the company—but it is an entirely independent organization and the general manager sits in as an honorary member because they want him, and not in any way to dictate.

Some of the principals in the Association of Superintendents of the Connecticut Quarries Co. on the occasion of their recent summer outing. Left to right—W. F. Quinn, treasurer; F. H. Edwards, ex-president; A. L. Worthen, honorary member; F. B. Kimball, president; R. D. Brewer, vice-president; R. S. Rose, secretary.

Members of the association, left to right, front row, W. F. Quinn, A. L. Worthen, F. B. Kimball, R. D. Brewer, R. S. Rose, A. Trevisan; top row, left to right, J. De Sandee, D. Singleton, H. Kennedy, E. Hutterman, F. J. Looby, J. McGrath, G. Jenkins, Wm. Cronan, E. H. Smith, Geo. Schafrik



An artist's conception of a commercial crushed stone plant

THE ILLUSTRATION above is interesting to us, and we believe it will be interesting to many readers, because it is a work of art, with a commercial crushed stone plant as a subject. Crushed stone plants are seldom considered things of beauty, and we leave it to the reader to decide if the artist has made it one in this case.

The sketch is part of a series made for the Vacuum Oil Co., New York City, and has been used in some of its advertisements in the popular magazines, notably in the *Saturday Evening Post*. It will be noted, of course, by the initiated, that the details of the plant are very sketchy, as an artist has a license to make them.

The only feature in the sketch that to us stands out in sufficient detail to be easily identified is the huge pile of scrap in the foreground. It may be the artist had a sense of humor. Anyhow, the picture is a sermon on plant untidiness; evidently our artist considers it so typical of crushed stone plants that a scrap pile is all the identification necessary.

Fortunately, while large scrap heaps are by no means uncommon accompaniments of commercial crushed-stone plants, and bespeak of progress toward bigger and better equipment, they are no longer the invariable appendage of such a plant. Recent emphasis on safety and accident prevention in the quarry industry has had an influence on plant housekeeping, the same as it has in every other industry which has taken up accident prevention work. Such a by-product of accident prevention activity is by no means the least advantage of organized safety work.

Struco Slate Review

A HOUSE ORGAN of unusual interest is the "Struco Slate Review," published by the Structural Slate Co., Pen Argyl, Penn., the second edition of which has just been received. The issue contains such informative articles as "Producing a Natural Product with Speed and Accuracy," outlining the history and development of slate, and "The Wire Saw in Slate Quarries," by Dr. Oliver Bowles, on which subject a complete article by the same author appeared in ROCK PRODUCTS, August 20, 1927. The book is exceedingly well illustrated.

Making Sand and Gravel Down in "Ole Alabam"

Southern Sand and Gravel Company's Operation at Selma, Ala., Described by a Sand and Gravel Poet

By R. C. Butler
Selma, Ala.

IT IS AN INTERESTING and instructive trip up the sleepy old Alabama River on the ancient but seaworthy *Tombigbee*. The *'Bigbee* was once a government dredge, is built of good stuff, and her husky old engines give promise of many years' service in digging up rocks from the bars of the Alabama.

Early Trips to the Sand Bar

If you will get up bright and early and not have too much to say, "Cap'm Crawf" Jackson will be glad to have you make a trip up to the bar with him on the *'Bigbee*. She leaves the plant on her first trip every morning at six o'clock. The bar being mined at present is about half a mile up the river, and with a good deal of snorting and puffing, the good ship, pushing a heavy barge, arrives in a short while and anchors to the cables which are laid to hold her over the bar.

Cap'm Crawf, a licensed pilot on several southern rivers, now has a good rest while Shorty Glatfelter gets busy with his 1-yd. clamshell bucket. Shorty has recently had a new 7½x9 American hoist installed on the nose of the *'Bigbee*. He is fond of his engines, is a licensed marine engineer, and a natural-born gravel digger. The first time the bucket grabs the bottom of the river and Shorty heaves up, you feel like the old boat is bound for Davy Jones' well-known locker. The *'Bigbee* prefers to operate in 5 to 10 ft. of water, but can go deeper.

In about two hours the barge is filled with several carloads of golden sand and gravel, and Shorty gives Cap'm Crawf the high-sign to let go. These two, with the assistant engineer and two colored boys for deck hands, form the crew of the *'Bigbee*. More snorts, and the old ship waltzes grandly down the river to deposit her unwieldy barge and, cackling like a delirious and monstrous hen, proudly trots off with another scow.

Halfway up the rather steep 60-ft. bank is a three-drum, two-cylinder, 8¼x10 American hoist, on a 40-hp. upright Mundy boiler set in concrete. This operates a stiff-leg derrick with a 72-ft. boom and a 12-ft. bull wheel. The sticks and girders are of local southern pine, and it is a problem to get a tree just right for the long arm. The pillars of the derrick are of reinforced concrete and run down into the soapstone bank to 10 ft. An experienced engineer operates the derrick with the aid of a darky fireman.

The hopper is built 35 ft. downstream from the engine shed, and its floor is about level with the top of the bluff. In low water there is a lift of 80 to 90 ft. from the barge to the top of the hopper, but the operator experiences no difficulty in keeping the 20-ton hopper full with his 1½-yd. clamshell bucket.

To raise the material to the top of the plant a belt conveyor is used. The lift is about 50 ft. and the belt 450 ft. long. It h been in constant use, unprotected from the weather, ever since the plant has been in operation, and has given no trouble at all. It is powered by the same 30-hp. General Electric induction motor which operates the revolving screens.

The dredge-run product is now ready to be washed and screened. There is some advantage in taking the material from under the water, as all loam and dirt are removed before this washing process takes place.

There is a 5-in. artesian well which empties into a pond 150 ft. from the plant. Quite often the negroes have "baptizin's" in the pond on Sunday afternoon, and it is not uncommon for some good "cullud sister" to step on a fish and have to grab "de parson" to be rescued.

Primary Screening

A 20-hp. Westinghouse motor operates a pump with a 4-in. suction and 3-in. dis-

The stern-wheel dredge "Tombigbee" and barge at the Southern Sand and Gravel Co. plant, Selma, Ala.

charge, which supplies plenty of water.

As the larger part of the product is used on state highway projects, all gravel over 1½ in. is screened out at the first sizing. The dredge-run product averages about 65% gravel and 35% sand. The belt empties the material into the first of a series of conical revolving screens of perforated sheet steel. The oversize amounts to about 1%, and runs through a steel chute to drop over on the side of the river bluff. It might pay to put in a crusher to save this, but the supply of usable sizes seems inexhaustible, and some of the waste is sold to fill in low places, being loaded by hand into trucks.

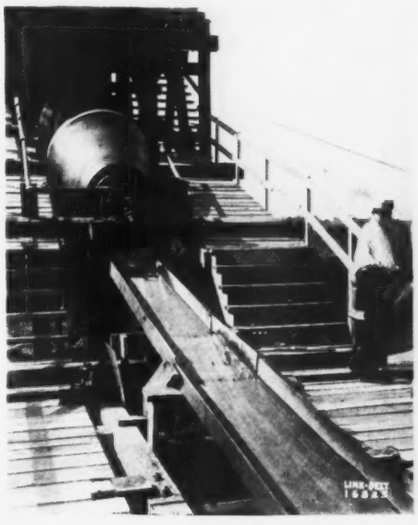
The throughs are washed into the second screen, which drops the oversize into the bin below. This is a ⅝-in. perforated screen and its throughs are carried to the third screen, with ¼-in. perforations, the oversizes, known as pea gravel, going to bins.

A steel chute carries the throughs over a $\frac{3}{16}$-in. perforated flat screen for making fine sand. This fine sand drops into a Link-Belt dewatering tank. The amount of fines taken out is regulated in exposing more or less of the screen by adjusting a sheet-steel cover. The coarse sand then drops into its cone and thence to the bin. These bins are each capable of holding two cars of material. There are gates and chutes on the west side to load cars for rail shipments, and a similar arrangement on the east for loading trucks. Two jets of water are played into each conical screen, and there is sufficient water to carry the overplus of sand or pea gravel to stock piles in the yard. This pea gravel might be considered a byproduct, and sometimes vast amounts accumulate. Recently the state purchased 400 cars of this material to be shipped to a district where there was plenty of red clay but no gravel. Mixed with a good grade of clay, it sets up like a rock and makes an unusually smooth, durable road. Market is also being found for this material to local contractors.

General view of the shore screening plant

The plant is within the Selma city limits and local trade is supplied with Dodge 2-yd., hydraulic-dump motor trucks.

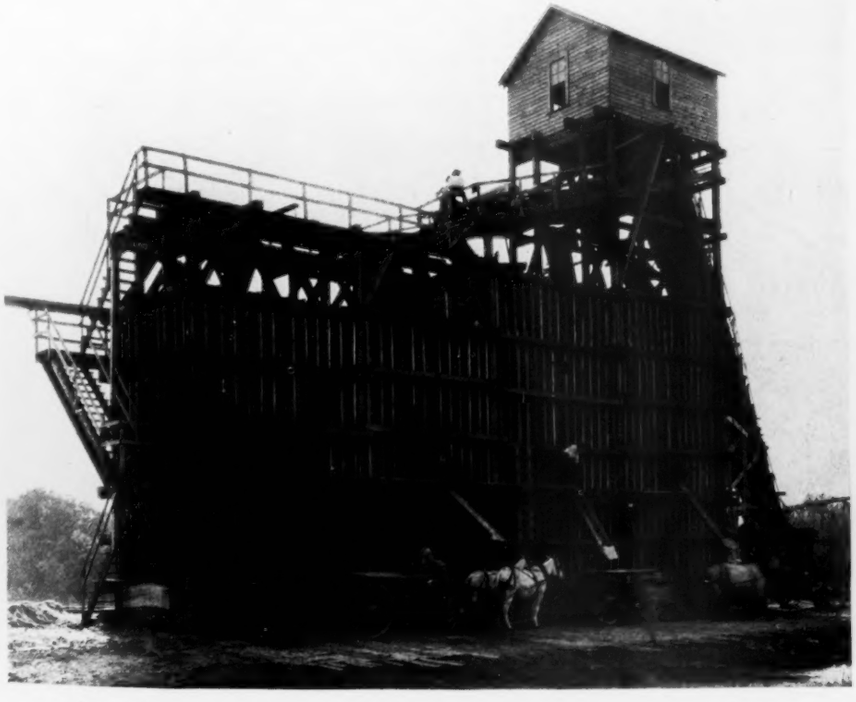
John Ziegler, the plant foreman, was born raising sand and has been at the job ever since. He can do anything around the place from fixing an engine to "cussin' out a deck hand," with equal facility and promptness. He employs six darkeys about the plant, and you couldn't bribe one of them to quit.



Atop the washing plant

The gravel mined is a very hard, clean material running in regular sizes. The sand is clean and sharp. Cores taken from a ten-mile paving job recently completed near this town marked up the highest breaking test yet shown by the laboratory to which it was sent. There has been no great drive for capacity operations, but the desire of the company to gain a reputation for quality and swift, sure service is rapidly being realized.

Filter gravel in five sizes is shipped as far as Florida, North Carolina and Tennessee. There are no facilities for getting out filter sand, but C. P. Cosby, secretary and manager of the company, intends to get around to this end of the business soon.



Material is loaded out to mule-drawn wagons driven by laconic darkeys

Grindability of Portland Cement Clinker

A Study of the Grindability and Quality of Portland Cement Clinker That Has Been Air-Cooled, and Clinker That Has Been Cooled by Quenching in Water

By Alton J. Blank

Formerly Chief Chemist, La Tolteca Cia. de Cemento Portland, S. A., Tolteca, Now General Superintendent and Supervising Chemist, Compania de Cimento Portland Lando, Puebla, Puebla, Mexico

IN CEMENT PLANTS having a clinker grinding capacity equal to, or greater than, their kiln capacity, and where it is necessary to grind the clinker within a few hours after its discharge from the kiln, the question of cooling the clinker by the quickest and most efficient means is of the utmost importance.

In cement plants where it has been customary to cool the clinker as it is discharged from the kiln by means of the water-spray system, or by dropping the clinker into a pit containing water, and where it is desirous to install rotary coolers for the purpose of reclaiming a part of the heat that is usually lost in the red-hot clinker discharged from the kiln, the grindability of clinker cooled by quenching in water as compared to the grindability of clinker cooled in air should be investigated. This is of special importance with cement plants where the power item in the grinding of clinker is large and where economy in that department is desired.

Likewise, in plants where the unsoundness tendency prevails in the clinker manufactured, the advantages and disadvantages of air-cooled and water-cooled clinker, insofar as quality is concerned, should come in for due consideration.

In view of the fact that results obtained on tests made in a small 12x12-in. experimental laboratory ball mill were generally confirmed by results obtained in larger mill units, it was decided to carry out these grindability tests on a small laboratory scale.

To that end five representative samples of clinker were taken from the kilns on succeeding days. Several hundred kilos of the red-hot clinker was collected as discharged from the kilns and thoroughly mixed and deposited in two separate piles on the firing floor. The one sample of clinker was allowed to cool gradually in air so as to be representative, more or less, of the gradual cooling effect had in a rotary cooler; the other sample was immediately quenched in water and allowed to cool in that way.

So as to be representative of mill conditions these samples of clinker were allowed to age for five days before being crushed in the small 4x4-in. laboratory jaw crusher, after which time they were subjected to preliminary and finish grinding in the 12x12-in. ball mill.

Factors entering into the grindability of the samples of clinker were constant in all tests made, being:

(1) Revolutions of mill, 64 r.p.m.
(2) Grinding time, 15-minute periods.
(3) Number of periods, five.
(4) Preliminary grinding, two 15-minute periods; ball load, 16 kilos of worn kominuter balls ranging in size from 3½-in. to 1¾-in. in diameter.
(5) Finish grinding, three 15-minute periods; ball load, 22 kilos of a mixture of 1¼-in. Concavex balls and ½x5⁄8-in. slugs.
(6) Amount of sample, 2½ kilos.
(7) Fineness of sample, more or less uniform in all.

Conclusions

Without exception, regardless of the length of time the clinker has been allowed to age, these tests have shown that air-cooled clinker grinds the easier in the preliminary grinding test where large balls are used, this test being similar to what could be expected in the coarse grinding of clinker in kominuters, ball mills or the other types of preliminary grinding mills.

And, in all tests, regardless of the length of time the clinker has been allowed to age, it has been shown that water-cooled clinker grinds the easier in the finish grinding test where small balls and slugs were used, this

TEST NO. 1, SAMPLE NO. 1—AIR-COOLED CLINKER, AGED 5 DAYS

Mesh of sieve	Fineness, original sample, % passing	Preliminary grinding, 15 min.	Preliminary grinding, 30 min.	% reduction	Finish grinding 15 min.	Finish grinding 30 min.	Finish grinding 45 min.	% reduction
4	56.50	91.60	99.00	.....	100.0	100.0	100.0	.....
10	10.40	85.60	99.00	.....	100.0	100.0	100.0	.....
20	2.60	77.00	98.90	96.30	100.0	100.0	100.0	.....
48	0.80	48.20	95.00	94.20	99.9	100.0	100.0	.....
100	0.64	31.10	66.40	65.76	89.7	99.7	100.0	33.5
200	0.46	22.36	48.80	48.34	67.9	97.9	99.5	50.7

TEST NO. 1, SAMPLE NO. 1—WATER-COOLED CLINKER, AGED 5 DAYS

Mesh of sieve	Fineness, original sample, % passing	Preliminary grinding, 15 min.	Preliminary grinding, 30 min.	% reduction	Finish grinding 15 min.	Finish grinding 30 min.	Finish grinding 45 min.	% reduction
4	65.60	98.24	99.90	.....	100.0	100.0	100.0	.....
10	15.68	95.04	99.90	.....	100.0	100.0	100.0	.....
20	5.04	84.08	99.70	94.66	100.0	100.0	100.0	.....
48	1.78	46.24	89.00	87.22	99.6	100.0	100.0	.....
100	1.34	28.12	57.00	55.66	81.3	99.8	100.0	42.85
200	1.10	19.88	42.30	41.20	60.4	96.8	99.3	57.00

CHARACTERISTICS OF CEMENT MADE IN TEST NO. 1 (1:3 Sand)

	Chemical analysis, average clinker	Age	Tensile strength, lb. per sq. in. Air-cooled clinker	Tensile strength, lb. per sq. in. Water-cooled clinker
SiO_2	20.90%	24-hour	88	99
Al_2O_3	6.99%	3-day	264	286
Fe_2O_3	3.81%	7-day	308	329
CaO	64.60%	14-day	330	402
MgO	2.07%	28-day	371	438
SO_3	0.41%	2-month	400	453
Ignition loss*	0.56%	3-month	429	506
Silica ratio	1.93	.....	.....	.....
Lime ratio	2.03	.....	.....	.....

*Equals ignition loss on air-cooled clinker. Ignition loss on water-cooled clinker was 0.88%.

TEST NO. 2, SAMPLE NO. 2—AIR-COOLED CLINKER, AGED 5 DAYS

Mesh of sieve	Fineness, original sample, % passing	Preliminary grinding, 15 min.	Preliminary grinding, 30 min.	% reduction	Finish grinding 15 min.	Finish grinding 30 min.	Finish grinding 45 min.	% reduction
4	65.84	97.12	100.0	.....	100.0	100.0	100.0	.....
10	20.20	91.12	100.0	.....	100.0	100.0	100.0	.....
20	10.20	82.60	99.9	89.70	100.0	100.0	100.0	.....
48	5.20	54.28	97.1	91.90	99.9	100.0	100.0	.....
100	3.80	35.00	69.6	65.80	91.2	99.8	100.0	30.3
200	3.06	24.08	50.8	47.74	68.2	98.0	99.5	48.7

TEST NO. 2, SAMPLE NO. 2—WATER-COOLED CLINKER, AGED 5 DAYS

Mesh of sieve	Fineness, original sample, % passing	Preliminary grinding, 15 min.	Preliminary grinding, 30 min.	% reduction	Finish grinding 15 min.	Finish grinding 30 min.	Finish grinding 45 min.	% reduction
4	77.72	97.40	100.0	.....	100.0	100.0	100.0	.....
10	21.64	86.92	100.0	.....	100.0	100.0	100.0	.....
20	12.52	72.12	99.9	87.38	100.0	100.0	100.0	.....
48	5.76	42.64	91.4	85.64	100.0	100.0	100.0	.....
100	3.40	26.64	59.8	56.40	83.2	99.5	100.0	40.1
200	2.10	19.04	43.4	41.30	63.6	95.7	99.3	55.9

CHARACTERISTICS OF CEMENT MADE IN TEST NO. 2 (1:3 Sand)

	Chemical analysis, average clinker	Age	Tensile strength, lb. per sq. in. Air-cooled clinker	Tensile strength, lb. per sq. in. Water-cooled clinker
SiO_2	21.20%	24-hour	198	220
Al_2O_3	6.76%	3-day	308	297
Fe_2O_3	3.84%	7-day	340	334
CaO	64.40%	14-day	414	415
MgO	2.00%	28-day	470	458
SO_3	0.41%	2-month	466	472
Ignition loss†	0.40%	3-month	528	462
Silica ratio	2.00	.....	.....	.....
Lime ratio	2.02	.....	.....	.....

†Equals ignition loss on air-cooled clinker. Ignition loss on water-cooled clinker was 1.02%.

test being similar to what could be expected in the fine grinding of clinker as is accomplished in tube mills.

As regards the quality of the clinker, inso far as tensile strength is concerned, results of these tests have shown on several occasions that water-cooled clinker gives the higher strength, though on the majority of the tests the air-cooled clinker gave the higher strengths.

It is therefore to be expected that all clinkers are not subject to improvement in strength qualities by being cooled in water, though it is shown that certain clinkers are particularly benefited by this method of cooling.

Insofar as the soundness feature is concerned, it has been our experience on a mill scale of results obtained that, when there is present in the raw mixtures being burned in the kilns too small a percentage of silica for combination with the lime, a clinker is produced that is in a poor state of combination and consequently has present a high percentage of free or uncombined lime. This clinker when cooled in air hydrates slowly and is usually unsound to a certain degree. However, by quenching this clinker in water the rate of hydration is greatly increased and usually results in the clinker being sound within a few days of the time it is discharged from the kiln.

It has also been our experience that an air-cooled clinker does not possess the workable and plastic properties that are had in a clinker that has been cooled in water.

Therefore the advantages of cooling clinker in air, to the same end that would be received in a rotary cooler, may be expressed as follows:

1. Easier grinding of the clinker in the preliminary grinding mill, such as a ball mill, kominuter, etc.
2. Slightly higher strength values for the cement on an average.

The disadvantages may be expressed as follows:

1. Harder grinding of the clinker in the finish grinding mill, such as the tube-mill.
2. Slower rate of hydration of the clinker resulting in a longer period of storage necessary for an initial unsound clinker to become sound.

The disadvantages had by cooling clinker by means of water may be expressed as follows:

TEST NO. 3. SAMPLE NO. 3—AIR-COOLED CLINKER, AGED 5 DAYS

Mesh of sieve	Fineness, original sample, % passing	Preliminary grinding, 15 min.	Preliminary grinding, 30 min.	% reduction	Finish grinding, 15 min.	Finish grinding, 30 min.	Finish grinding, 45 min.	% reduction
4	56.76	95.20	100.0	.....	100.0	100.0	100.0	.....
10	15.28	90.36	100.0	.....	100.0	100.0	100.0	.....
20	5.64	82.84	100.0	94.36	100.0	100.0	100.0	.....
48	2.04	50.92	95.4	93.46	100.0	100.0	100.0	.....
100	1.12	31.48	65.8	64.68	88.6	99.8	100.0	34.1
200	0.76	21.92	48.2	47.44	68.2	97.9	99.5	51.3

TEST NO. 3. SAMPLE NO. 3—WATER-COOLED CLINKER, AGED 5 DAYS

Mesh of sieve	Fineness, original sample, % passing	Preliminary grinding, 15 min.	Preliminary grinding, 30 min.	% reduction	Finish grinding, 15 min.	Finish grinding, 30 min.	Finish grinding, 45 min.	% reduction
4	69.48	99.28	100.0	.....	100.0	100.0	100.0	.....
10	21.90	96.48	100.0	.....	100.0	100.0	100.0	.....
20	8.18	82.84	99.9	91.72	100.0	100.0	100.0	.....
48	3.22	41.44	81.4	78.18	99.4	100.0	100.0	.....
100	1.98	25.24	49.2	47.22	83.6	92.3	99.8	50.6
200	1.52	18.36	35.2	33.68	53.2	67.2	97.0	61.8

CHARACTERISTICS OF CEMENT MADE IN TEST NO. 3 (1:3 Sand)

	Chemical analysis, average clinker	Age	Tensile strength, lb. per sq. in.—Air-cooled clinker	Tensile strength, lb. per sq. in.—Water-cooled clinker
SiO_2	20.80%	24-hour	100	105
Al_2O_3	7.54%	3-day	297	290
Fe_2O_3	3.26%	7day	380	308
CaO	64.20%	14-day	427	380
MgO	2.17%	28-day	490	419
SO_3	0.38%	2-month	536	451
Ignition loss‡	0.70%	3-month	605	554

‡Equals ignition loss on air-cooled sample. Ignition loss on water-cooled sample was 1.08%.

TEST NO. 4. SAMPLE NO. 4—AIR-COOLED CLINKER, AGED 5 DAYS

Mesh of sieve	Fineness, original sample, % passing	Preliminary grinding, 15 min.	Preliminary grinding, 30 min.	% reduction	Finish grinding, 15 min.	Finish grinding, 30 min.	Finish grinding, 45 min.	% reduction
4	59.86	96.52	100.0	.....	100.0	100.0	100.0	.....
10	22.50	94.00	100.0	.....	100.0	100.0	100.0	.....
20	13.96	89.00	99.9	85.94	100.0	100.0	100.0	.....
48	8.12	61.52	98.9	90.78	100.0	100.0	100.0	.....
100	5.65	42.32	81.2	75.55	96.1	99.9	100.0	18.7
200	3.95	31.24	61.8	57.85	78.8	98.9	99.6	37.8

TEST NO. 4. SAMPLE NO. 4—WATER-COOLED CLINKER, AGED 5 DAYS

Mesh of sieve	Fineness, original sample, % passing	Preliminary grinding, 15 min.	Preliminary grinding, 30 min.	% reduction	Finish grinding, 15 min.	Finish grinding, 30 min.	Finish grinding, 45 min.	% reduction
4	63.00	99.68	100.0	.....	100.0	100.0	100.0	.....
10	22.76	98.28	100.0	.....	100.0	100.0	100.0	.....
20	10.50	88.36	99.9	89.40	100.0	100.0	100.0	.....
48	5.38	50.12	94.8	89.42	99.9	100.0	100.0	.....
100	3.72	31.88	66.5	62.78	89.6	99.9	100.0	33.4
200	2.28	22.68	48.7	46.42	68.2	98.8	99.7	51.0

CHARACTERISTICS OF CEMENT MADE IN TEST NO. 4 (1:3 Sand)

	Chemical analysis, average clinker	Age	Tensile strength, lb. per sq. in.—Air-cooled clinker	Tensile strength, lb. per sq. in.—Water-cooled clinker
SiO_2	20.84%	24-hour	231	220
Al_2O_3	6.84%	3-day	286	264
Fe_2O_3	3.26%	7-day	440	374
CaO	64.60%	14-day	510	412
MgO	2.09%	28-day	533	469
SO_3	0.51%	2-month	583	431
Ignition loss§	0.70%	3-month	492	363
Silica ratio	2.06	.....	.....	.....
Lime ratio	2.08	.....	.....	.....

§Equals ignition loss on air-cooled sample. Ignition loss on water-cooled sample was 0.98%.

TEST NO. 5. SAMPLE NO. 5—AIR-COOLED CLINKER, AGED 5 DAYS

Mesh of sieve	Fineness, original sample, % passing	Preliminary grinding, 15 min.	Preliminary grinding, 30 min.	% reduction	Finish grinding, 15 min.	Finish grinding, 30 min.	Finish grinding, 45 min.	% reduction
4	60.16	98.72	100.0	.....	100.0	100.0	100.0	.....
10	27.60	97.16	100.0	.....	100.0	100.0	100.0	.....
20	17.00	93.84	99.9	82.90	100.0	100.0	100.0	.....
48	8.16	63.92	97.0	88.84	100.0	100.0	100.0	.....
100	4.52	40.16	68.5	63.98	88.6	99.8	100.0	31.5
200	2.88	27.44	51.6	48.72	65.9	96.6	99.2	47.6

TEST NO. 5. SAMPLE NO. 5—WATER-COOLED CLINKER, AGED 5 DAYS

Mesh of sieve	Fineness, original sample, % passing	Preliminary grinding, 15 min.	Preliminary grinding, 30 min.	% reduction	Finish grinding, 15 min.	Finish grinding, 30 min.	Finish grinding, 45 min.	% reduction
4	76.40	99.60	100.0	.....	100.0	100.0	100.0	.....
10	31.32	98.64	100.0	.....	100.0	100.0	100.0	.....
20	16.40	90.00	99.9	83.50	100.0	100.0	100.0	.....
48	6.84	50.80	98.8	91.96	99.9	100.0	100.0	.....
100	3.64	30.28	55.2	51.56	77.6	99.4	100.0	44.7
200	2.48	20.28	37.8	35.32	55.2	91.0	99.9	61.2

CHARACTERISTICS OF CEMENT MADE IN TEST NO. 5 (1:3 Sand)

	Chemical analysis, average clinker	Age	Tensile strength, lb. per sq. in.—Air-cooled clinker	Tensile strength, lb. per sq. in.—Water-cooled clinker
SiO_2	20.40%	24-hour	253	165
Al_2O_3	7.06%	3-day	272	224
Fe_2O_3	3.04%	7-day	316	253
CaO	64.98%	14-day	365	288
MgO	2.24%	28-day	430	319
SO_3	0.38%	2-month	446	374
Ignition loss¶	0.72%	3-month	396	363
Silica ratio	2.01	.....	.....	.....
Lime ratio	2.13	.....	.....	.....

¶Equals ignition loss on air-cooled sample. Ignition loss on water-cooled sample was 1.26%. Air-cooled was unsound at 5 days. Water-cooled sample was sound at 5 days.

TEST NO. 6. SAMPLE NO. 1—WATER-COOLED CLINKER, AGED 2 WEEKS

Mesh of sieve	Fineness, original sample, % passing	Preliminary grinding, 15 min.	Preliminary grinding, 30 min.	% reduction	Finish grinding, 15 min.	Finish grinding, 30 min.	Finish grinding, 45 min.	% reduction
4	66.88	94.68	100.0	.....	100.0	100.0	100.0	.....
10	24.64	88.28	99.9	.....	100.0	100.0	100.0	.....
20	11.72	77.72	99.6	87.88	100.0	100.0	100.0	.....
48	5.48	45.96	90.0	84.52	99.9	100.0	100.0	.....
100	3.40	29.16	58.8	55.40	81.3	99.6	100.0	41.1
200	2.44	21.16	42.8	40.36	61.6	93.7	98.9	56.1

TEST NO. 6. SAMPLE NO. 2—AIR-COOLED CLINKER, AGED 2 WEEKS

Mesh of sieve	Fineness, original sample, % passing	Preliminary grinding, 15 min.	Preliminary grinding, 30 min.	% reduction	Finish grinding, 15 min.	Finish grinding, 30 min.	Finish grinding, 45 min.	% reduction
4	67.20	93.88	100.0	.....	100.0	100.0	100.0	.....
10	24.80	83.40	99.9	.....	100.0	100.0	100.0	.....
20	10.72	67.60	99.7	88.98	100.0	100.0	100.0	.....
48	4.16	37.04	73.5	69.34	97.7	100.0	100.0	.....
100	2.40	21.88	45.7	43.30	67.8	98.5	100.0	54.2
200	1.60	15.20	33.0	31.40	49.9	84.9	98.2	65.2

CHARACTERISTICS OF CEMENT MADE IN TEST NO 6

Age	Tensile strength, lb./sq.in. Air-cooled clinker	Water-cooled clinker
24-hour	77	66
3-day	143	193
7-day	242	261
14-day	343	316
28-day	374	396
2-month	440	434
3-month	484	440

Note—The above sample of air- and water-cooled clinker is the same as the sample tested in Test No. 1. However, Test No. 6 was made on the sample after it had been aged 2 weeks.

1. Harder grinding of the clinker in the preliminary grinding mill, such as the ball mill, kominuter, etc.
2. Deterioration in strength qualities to a slight degree of the cement made of some types of clinker.

While the advantages from this method of cooling are:

1. Easier grinding of the clinker in the finish grinding mill, such as the tube-mill, and since the greater power consumption is had in the fine grinding of the clinker, in comparison with the lesser amount of power required in the preliminary grinding, this factor constitutes quite an important item.
2. Rapid rate of hydration had in a clinker resulting in a shorter storage period being necessary for an initially unsound clinker to become sound.
3. Greater plasticity and workability of the cement made from the clinker.

So, where the installation of the rotary cooler method for cooling clinker has its advantages in the amount of heat reclaimed from the clinker, the easy preliminary grindability of the clinker and somewhat higher strength values for different types of clinker, this method of cooling clinker has its disadvantages in view of the hardness the finish grindability of the clinker, and the greater length of time required for an initially unsound clinker to become sound.

Therefore, with the air cooling method it remains only a question as to whether the advantages derived offset the disadvantages received.

In our particular case we are of the belief that by cooling the clinker by the air method had in the rotary cooler installation and thus reclaiming a considerable portion of the heat that is usually lost in the clinker discharged from the kilns, the advantages derived will more than offset the disadvantages that may be had in the grindability and unsoundness factors.

Mid-West Company Making New Masonry Cement

THE Mid-West Crushed Stone Co., Greencastle, Ind., has a large crushing plant crushing a hard high calcium limestone, using gyratory crushers and rotary screens throughout. One unusual feature of the plant is that all the rotary screens are enclosed in cloth housings as a means of dust control. These enclosures, chutes and in fact any place where dust is given off, are served by a suction pipe connected to two fans and the dust thus gathered is recovered in Cyclone collectors. This results in a mill that is remarkably free from dust, and many other producers using the dry method of screening could profit from this company's example.

At the time of inspection, a new plant for the manufacture of "Rock-C-Ment," a masonry cement was being placed in operation for the first time. "Rock-C-Ment" has for its basic ingredients portland cement, pulverized limestone, and "Aquagel." Aquagel is a patented plasticizer and waterproofing compound for cements and concretes and its properties were described in Rock Products, June 8, 1929, p. 117.

For the production of this material high calcium limestone will be pulverized in a Raymond "kiln-mill," a new type of mill recently brought out and which combines drying as it grinds. Temperatures are controlled by Foxboro recording thermometers. This method is claimed to insure a dry and uniform product; pulverizing the limestone to requirements (85% through a 200-mesh screen), would be a serious problem but for the convenience of this method of pulverizing, the operators stated.

The Raymond mill delivers the pulverized product by means of a suitable fan to steel bins over the mixing hopper. A one-ton Ehrsam mixer is used to mix the three ingredients of "Rock-C-Ment" after which the product falls to a screw conveyor and is then elevated to a steel bin over the Bates packers.

The cement will be marketed in 67-lb. Adams "Neverburst" paper bags, a somewhat smaller size container than the usual.

The executive officers of this company are: C. C. Cartwright, president; L. R. Cartwright, vice-president; Charles F. Meyer, Jr., secretary; Earl R. Cartwright, treasurer, and E. B. Taylor, sales manager. John Murname is superintendent of the Greencastle plant.

Income Tax Reports Show Profit of 3.2% in Construction

FORTY PER CENT. of the construction corporations doing business in 1926 made no net income or suffered losses on their operations for that year. This is revealed by a statistical study and analysis of the Federal Income Tax report for 1926 recently completed by C. S. Embrey of the Associated General Contractors. The complete tax report for 1926 is the latest one published and covers the sworn income tax statements of 16,770 construction corporations.

While 60 per cent or 10,075 of the constructors were reported as having made a combined net profit of 6.25 per cent on the $2,816,000,000 worth of work constructed by them the combined losses reported on 40 per cent or 6,695 construction firms was the equivalent of a 10 per cent loss on the volume of business done by the later group.

The average annual volume of work done per firm by the 10,075 firms which made a profit was approximately $227,000.

The annual volume of work done by those firms which made no profit or which experienced losses averaged $79,000 per firm.

The complete analysis as made by Mr. Embery is given below.

AN ANALYSIS OF CONSTRUCTION PROFITS IN 1926 AS TAKEN FROM INCOME TAX REPORTS

Construction corporations filing reports		16,770
Construction corporations reporting net income		10,075
Construction corporations reporting no net income		6,695
Total amount of work performed by the 16,670 concernings filing reports		$2,816,000,000
Volume of work performed by the 10,075 concerns		2,287,000,000
Total profit		162,000,000
Average volume of work per concern		226,000
Average gross profit per concern		16,000
Average gross percentage of profit		7.1%
These 10,075 concerns paid income taxes on 1926 profits to the amount of		19,000,000
Leaving a total net profit of		143,000,000
Average per cent of net profit		6.25%
Volume of work performed by the 6695 concerns		528,548,000
Total loss		53,621,000
Average volume of work per concern		79,000
Average loss per concern		8,000
Average percentage of loss		10%
Grand total volume of all contracts		2,816,000,000
Gross profit of all contracts		162,000,000
Gross loss of all contracts	$53,621,000	
Income tax paid	19,000,000	
Total deductions for loss and income tax		72,621,000
Total net profit		89,379,000
Total net profit in per cent		3.2%
The average profit per concern		5,330

American Standards Year Book

IMPORTANT developments in the national standardization activities of almost every major American industry are described in the American Standards Year Book, 1929, a review of the national industrial standardization movement during the past 12 months, published recently by the American Standards Association, 29 West 39th Street, New York. The review covers mechanical, electrical, building, transportation, mining, textile and many other industries.

The book lists altogether about 150 national standards which have already been completed and about 175 other national projects now under way. It also lists nearly 550 trade associations, technical societies and other organizations which have been co-operating in the establishment of industrial standards under the Association's procedure and approximately 2200 individuals who have been active in the work of the technical committees engaged on the projects.

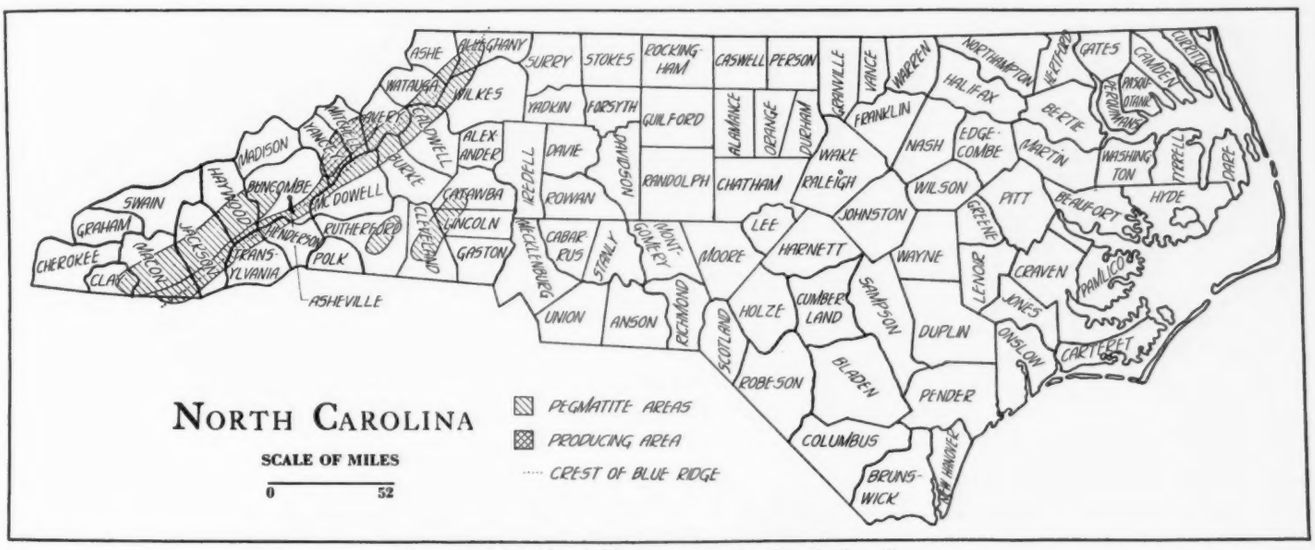
Feldspar Mining in North Carolina

By H. J. Bryson
North Carolina State Geologist, Raleigh, N. C.

FELDSPAR is the name assigned to a group of minerals consisting of several species, all silicates of alumina, with one or more of the bases, potash, soda and lime. These species are divided into two groups, the potash feldspars and the lime-soda feldspars, of which the former group is by far the more abundant in North Carolina. Orthoclase and microcline, whose composition is expressed by the formula $KAlSi_3O_8$, are the chief representatives of the first group, while albite, with a formula $NaAlSi_3O_8$, is the most important of the second or plagioclase group.

Feldspar is used chiefly as a flux in the manufacture of pottery, electrical porcelain, and some enameled wares. For these materials the spar must be very low in iron and not over 5% or 10% free quartz. It is also used as a flux or binder in emery or carborundum wheels, and to some extent in the manufacture of glass. For the last purpose it can carry 25% of free quartz. Feldspar possesses advantages over quartz as an abrasive in scouring soap because it is softer and less liable to scratch. The high grade selected feldspar is used in the manufacture of artificial teeth. It has been suggested that feldspar can be used as a fertilizer because of its high potash content, but no commercially practicable means of extraction has as yet been found.

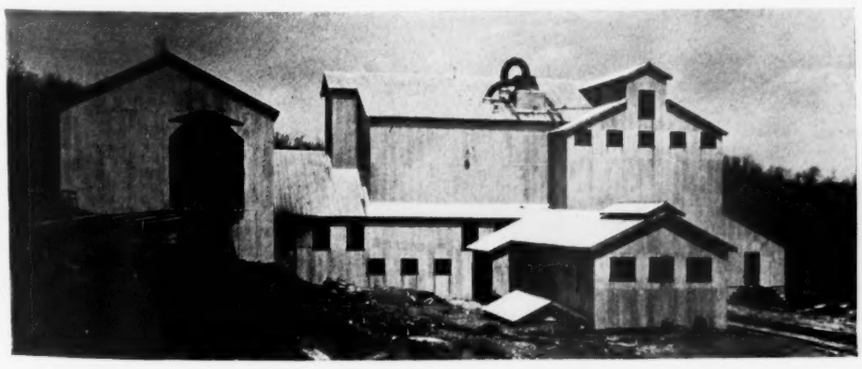
The feldspar industry in North Carolina is now one of the most important mineral industries in the state, and the producing area, including three counties, Avery, Mitchell and Yancey, in the western part of the state, is the most important feldspar producing center in the world. Over 60% of the total production in the United States comes from this locality.



Map showing the feldspar areas in North Carolina

Deposits Uniform and Easily Accessible

The most important factors which have caused the production to increase so rapidly since the first carload was shipped in 1911 are the large, accessible and comparatively uniform deposits; good transportation facilities in the form of railroads and paved highways; abundance of cheap, native white labor; and the favorable climate which permits mining during the entire year. These four factors have caused the center of production to move, within the past 10 years, from the north Atlantic states to North Carolina.



New mill of Feldspar Milling Co.

Occurrence and Distribution

Feldspar occurs in pegmatite dikes. These dikes are known in more than 20 counties (see map) in the state, confined principally to the mountain district. The pegmatite belt is almost 100 miles wide and extends in a northeast-southwest direction paralleling the Blue Ridge mountains. The main feldspar belt may be divided into three smaller belts as follows: The Cowee-Black mountain belt, the Blue Ridge belt, and the Piedmont belt. The Cowee-Black mountain belt, which lies to the west of the Blue Ridge mountains, includes parts of Macon, Jackson, Transyl-

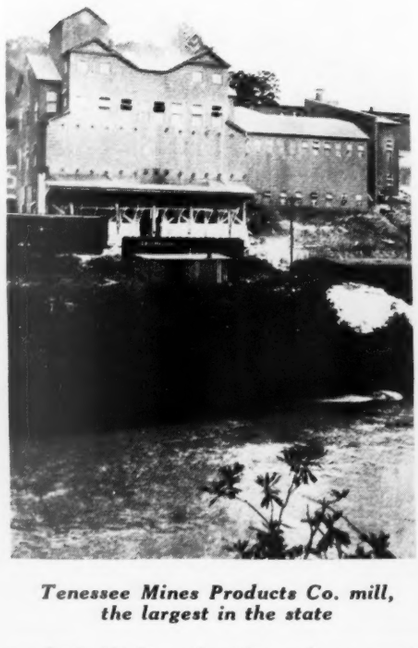
vania, Haywood, Buncombe, Yancey, Mitchell and Avery counties, has produced all of the feldspar mined in this state. The chief producing district, of which Spruce Pine is the center, is confined to the last three named counties. This district is about 40 miles long and 14 miles wide and is the most promising district of the south.

Pegmatites

Pegmatites are coarse grained granites

End of aerial cable, showing tipple and bin. This system of transportation is typical for mines inaccessible to motor trucks

composed chiefly of feldspar, quartz and mica. However, a great many other minerals have been found associated with them, some of which have been of commercial importance. Minerals other than the feldspars, quartz, and muscovite mica, which have been found rather frequently associated with the pegmatites, are beryl (as golden, blue, emerald, and aqua-

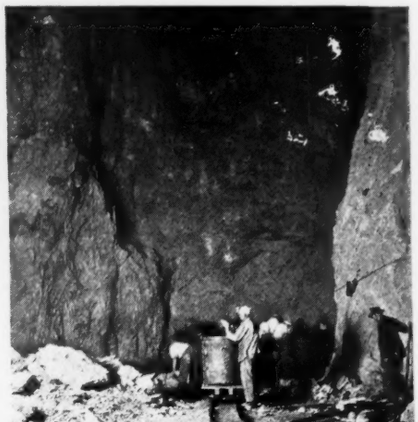


Tenessee Mines Products Co. mill, the largest in the state

marine), biotite, columbite, galena, garnet (several varieties), hematite, kyanite, magnetite, pyrite, tourmaline and uraninite or pitchblende.

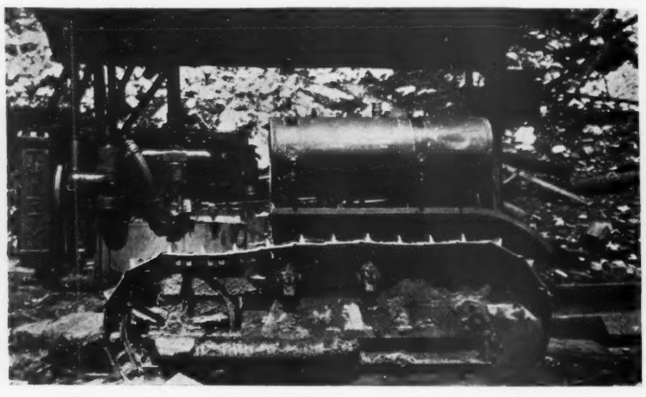
The question of the origin of pegmatites has been discussed for many years, but no definite conclusions have been drawn. It is generally believed, however, that they represent the residual portion of granite magmas, but in just what condition the materials were during the time of injection is not definitely known. Some conclude that they were in a more or less aqueous condition and came up under little pressure, while others argue that they were more viscous and came up under considerable pressure. There are arguments for both sides. Usually the dikes run more or less parallel with the schistosity of the enclosing rocks, but sometimes they cut these rocks at right angles. Where they follow more or less the schistosity the wall rock is little affected, which would indicate little pressure; while, on the other hand, where they cut the enclosing rocks at right angles the wall rock is folded into a series of fan folds for 15 or 20 ft. from the contact. This intense folding would indicate considerable pressure.

Another question which has never been settled is the cause of the large crystals in pegmatites. Generally speaking, slow cooling of a magma gives large crystals, and fast cooling small crystals. This, however, is not the case with the pegmatites, because some of the smallest dikes

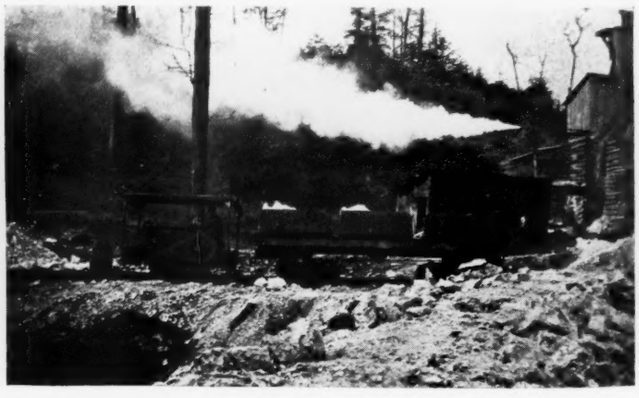


Deer Park mine, the only underground feldspar mine in the state

contain the largest crystals, especially mica crystals. If fast cooling of the pegmatites caused small crystals, the smaller the dike the more rapid the cooling and consequently the smaller the crystals. This is not true, as stated above, so another reason must be given. It has been suggested that as long as the magma was in motion, crystals grew, because the moving solutions provided the necessary mineral matter for the crystals. Then just as the magma froze or ceased moving, the



Caterpillar tractors are used at some mines for hauling spar



Other companies use this type of gasoline train for haulage

crystals stopped growing. This would explain the cause of the large crystals in the small dikes.

The pegmatite dikes assume numerous forms and shapes. They may parallel the planes of schistosity of the enclosing rocks or may cut them at any angle. The width of the dikes varies from stringers less than an inch in width to several yards, and the length may be only a few feet or several hundred yards. The depth varies as much as the width; some of the dikes in this state have been worked to a depth of 150 or 200 ft., and one dike has even been worked to a depth of 250 ft. Sometimes they give out at a very shallow depth. The larger dikes often have horses of slate imbedded in them, some of which reach enormous sizes and are too expensive to move.

Mining Practice

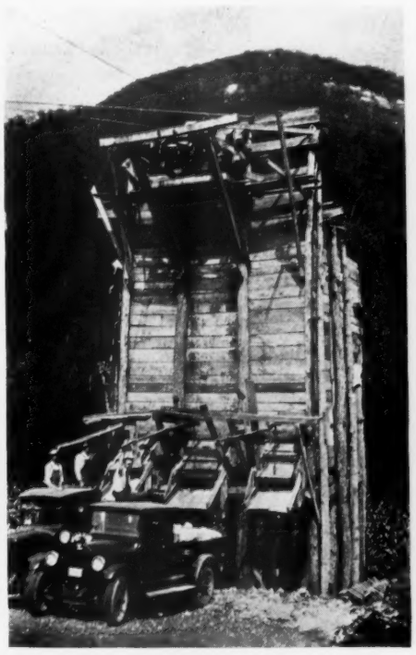
All of the feldspar produced in this state is mined by the open pit method, except that produced at one underground mine, the Deer Park mine. This mine does not operate at full capacity due to the high cost of mining. The overburden on the dikes is moved by hand, drag scraper, or hydraulic methods, depending entirely on local conditions. Since most of the mines are on the hillsides, the "bench" method is used in order to give more working face in the narrow dikes. In the larger mines drilling is done by compressed aid drills; but in the smaller, isolated mines, hand drills are employed. Just enough dynamite is used to wall-loosen the spar, and after this is done, picks, crowbars and other similar tools are used to get the spar. The spar is then "hand-cobbed" to free it of impurities, especially quartz and mica. This "hand-cobbing" is one of the most expensive steps in the mining of the spar. On the average only one ton of marketable spar is recovered to every five tons of "ore" mined. The cost of mining, then, depends on the percentage of marketable spar recovered. In some of the best mines the actual mining has been as low as $1.90 per ton, while in others it runs as high as $5. The average cost of mining under all conditions is about $3 per ton.

Transportation

Various methods of transporting the crude spar from the mines to the railroads or grinding plants are employed. When the mines are located on or near the paved roads, automobile trucks are used, and at mines inaccessible for automobile trucks the means of transportation are the aerial tramway, narrow gage tram, and caterpillar tractor. The three largest and most productive mines are served by narrow gage tram roads. Three other large mines are served by aerial tramways with tipple and storage bins at the railroad or highway. The tipple shown in the accompanying illustration is connected with the mines by a single span cable about 2200 ft. long. The mines can be seen on the mountain in the background. The cost of transporting the spar to the railroad or grinding plants depends, of course, on the methods employed and the distance. The cost varies from 35 cents to $2 per ton, with an average of about $1.25.

New grinding plant of Golding Sons at Spruce Pine

Two of the modern mills have practically abandoned the "hand-cobbing" process by installing jaw crushers and picking belts. The largest grinding plant in the state, Tennessee Mines Products Co., has the crusher and picking belt at the plant and all the material taken from the mine is transported to the mill. The mine, the only underground mine of importance operated in the state, is about one mile from the plant on the opposite side of the river. The product of the mine is taken by gasoline tram to a point opposite the plant on the same side of the river as the mine. From here the spar is taken by aerial tramway to the storage bin and crusher.



Tipple and storage bins at highway; the mines can be seen in the distance

The most recent mill in the district, that of the Feldspar Milling Co., does not have the picking belt at the plant, but the crusher, picking belt, tipple and crude bins are at the mines. It thus eliminates the extra handling of the crude spar, as only that spar which can be marketed is transported from the mines to the mill. (A more complete description of this mill will be given at an early date in Rock Products.)

Milling

At the present time there are four feldspar grinding plants operating in North Carolina, with a fifth under construction, which will begin operations at an early date. The modern grinding plants are quite different in design from the older plants. A flow sheet of one of the modern mills is about as follows: Crude material from the mines is hauled in cars on a narrow gage railroad to a loading station. Here it is reloaded on a cable car and carried to a 250-ton bin. From this bin the material is carried on a Stephens-Adamson apron feeder to a 3-in. grizzly. It then drops on a 30-in. picking belt, 138 ft. long, which carries it over a row of twenty 150-ton crude storage bins. From here the spar is hauled by hand to two Reliance crushers. Leaving the crushers, the spar is conveyed by two 14-ft. conveyors to an elevator which carries it to the top of the plant. These conveyors discharge into a 14-ft. conveyor which in turn transports it into the Dodge shuttle conveyor, emptying into intermediate storage bins. From these bins a horizontal conveyor carries the material to the foot of another elevator into the James automatic feeder. A short conveyor then carries the spar to three Hardinge mills. After several hours' grinding, elevators connecting with each mill transport the powdered spar through an air separator. All the material which does not pass a certain screen test is carried back to the mills and reground.

Every carload of spar shipped is guaranteed to pass a certain screen test and to have a certain chemical analysis. The buyers are thus assured of a uniform product both physically and chemically.

Production

The grinding capacity of the mills operating in this state is about 400 tons per 24-hour day. If these mills operate at full capacity in 1929 the production will be by far the largest on record.

In 1928, the last year for which statistics are available, North Carolina was the largest producer of crude feldspar. Its output was over three times as large as that of New Hampshire, the second state. Sales of crude feldspar for that year increased 4,804 tons, or about 4% in quantity, and $17,828, or 3% in value, compared with 1927. The quantity in 1928 was the highest ever recorded in the state. According to estimates for 1929, the production and value will be even larger than in the year 1928.

PRODUCTION OF FELDSPAR IN NORTH CAROLINA, 1925 TO 1928, INCLUSIVE

Year	Long tons	Value
1925	76,806	$496,563
1926	91,433	602,020
1927	100,756	612,214
1928	105,560	630,042

Monozite in Sands Along South Atlantic Coast

A. F. GREAVES-WALKER, professor of Ceramic Engineering in the North Carolina State College of Agriculture and Engineering, Raleigh, in the course of a letter to the *Manufacturers Record* giving some information about the monozite in the Florida seashore sands, writes:

"These sands produced a 75% concentrate which ran 55% ilmenite, 20% zircon, 6% rutile and 2% monozite, the monozite running about 4 to 6%.

"About the first of this year the operation at Mineral City (Pablo Beach) shut down. No reasons have been given. Only about one-half of the deposit at that point has been worked out. Some monozite was shipped from these working after the war, but of late it appears that no attempt has been made to save it and it is thrown out in the tailings.

"My opinion, based on the experience in other localities, is that the top sands of the Florida deposits were much richer in monozite than those below and that what looked like a good proposition petered out.

"Very little information on the subject has been available during the past few years, but what did come out has been given a favorable coloring.

"While it looks as though we could expect nothing along the monozite lines from Florida, the fact remains that the sands of the entire east coast from St. Simons Island to Eau Gallie are rich in ilmenite, rutile and zircon, and that the tremendous reserves will some day be worked."

The Law of Averages as Applied to the Relation of Feldspar Prospects to Feldspar Mines

By H. N. Kirk
H. N. Kirk & Co., Keene, N. H.

BY THIS TITLE is meant is there a producing mine developed from a certain number of attempts to develop prospects? Life insurance companies insure your life at a specified rate based on your age, state laws and other factors. This rate is determined to a large degree by the law of averages. The insurance companies' experts gather together all data needed as to death rates at different ages, occupations, etc., and have to date made their rate so accurate that they are on a firm business basis.

It might be of interest to those interested in the mining of feldspar to take notice of the observations that one of the oldest operators of mica and feldspar I know made here in this locality in New Hampshire. He found out that out of about 28 prospects for feldspar only one proved a producer. This average could have been made better without doubt, as most of the attempts were made by people who lacked capital or courage to prove some prospects a failure beyond doubt.

But if you say the law of averages applies to the amount of capital and courage that the average prospector has, then we really have a fairly true ratio of 1 to 28 or 1 out of 28 feldspar prospects will become a producer in New Hampshire.

If the prospecting were all done by well financed companies with plenty of capital and experience as to picking out pegmatite dikes that were expected to be producers the ratio would be better, without doubt, but the ratio above included many small prospectors who lacked capital.

Here is also a theory that I cling to and do not hesitate to say that it has been proved to a great extent. A large yielding mica vein will most always have a large body of feldspar not far away. I believe large mica veins indicate the presence of large feldspar bodies near. The rule also works out the other way as well. A large feldspar body indicates a large mica vein.

You may know of an instance where only one of the above minerals have been produced, but if the walls had been cored-drill it might have proved that what was thought a wall was a large horse rock of the country rock. Also a layer of slate may conceal and form a parting between the feldspar and mica veins. The largest feldspar mine in New Hampshire, Golding Keene Co.'s, at Alstead, was mined for years on a large rich mica vein by other parties before this mine became a producer of feldspar. Now to prove that a large feldspar pit may be worked for a period of years without producing any mica and still have mica near it I will give an illustration.

At a feldspar mine in Connecticut a large company had a 12-year lease on the property. This lease was drawing to a close. The walls of this pit were nearly perpendicular and no vein of mica was showing on either wall. Near the top of the pit was a large scale of pure feldspar, some tons that had been left for some unknown reason or no reason at all. The man in charge of the mine was told to blast off this scale into the pit to salvage this large scale of pure spar. The driller proceeded to do this, but he placed his drill holes back in the slate playing safe, for fear that the jar of the drills would peel off this scale if he was to drill on the overhang. At the surface of the slate no mica of any amount showed, but as the drilling progressed the drill dust showed nothing but mica in every hole, along the entire depth except the top. The holes were loaded and shot and such a showing of low grade mica as one seldom sees was exposed. For the rest of their lease they mined mostly mica; but for the removal of that large scale of feldspar from one of the walls of this pit the vein of mica very likely would not have been known. Here was a true case of a slate parting between feldspar and mica, so I believe that the law of averages will apply here of finding large mica veins and large feldspar bodies going hand in hand. So if you have a pit that is a large producer of feldspar and no mica vein is exposed, put long test holes into your side walls from time to time and test them out.

If you are working a large mica vein the chances are that nearby is a large feldspar body, but it may be good or poor.

Another example that mica and feldspar go hand in hand is at Wilmont, N. H., where a very high grade mica is being mined and also feldspar. Here feldspar was the desired mineral sought, but the fact that such a fine showing of clear mica in large blocks of large size was found that they could not concentrate wholly on the mining of feldspar. This mine is perhaps the youngest one in the state and I am told by those who have seen the mica that it runs very large and clear. A big future is predicted for this mine and it may exceed and excel all others eventually in this state. It is owned and operated by a company that has plenty of capital so it can be developed on lines worthy of its showings.

Screening Practice in England*

Results of an Interesting Series of Experiments with Rotary Screens

By A. S. D. Crone
Porthgain Quarries, Porthgain, Pembrokeshire

OWING to the changed conditions in the roadstone trade, the question of screening has of late years come into prominence, and judging from the many interesting publications on the subject in your *Journal,* it would appear that quarry managers and manufacturers have been trying to devise something which would give better results than obtained formerly with plain rotary screens. In experimenting with the same class of machinery for many years I have obtained the following results, which may prove of interest to your readers.

Movement of Material in Rotary Screens

On studying the movement of the material to be sifted in plain rotary screens, it will readily be seen that only one quadrant of the screen surface is actually engaged; and further, the material instead of sliding over the holes, partakes of the rotation of the screen, thereby forming a roll or column, with the coarser parts in contact with the screen plates, imprisoning the "fines" in the center, and again of this column it can be demonstrated that the greater amount of sifting takes place at two points, viz:—at the highest of the column where the material loses its repose, and also at its lowest point, where the material again makes fresh contact with the plates; it is, therefore, obvious that the efficiency in sifting is very low, as shown in Fig. 1.

In a screen handling 2½-in. to dust, with rejections direct from crushers, this rolling action is bad; but when we have the same size screen dealing with the same quantity of ½-in. to dust, with rejections, we find it very much worse, owing to the fact that there are 125 times more particles in the bulk and for this reason dust and other smalls will pass down the center of the column, even in a very long screen, and return with rejections to the crushers.

Effect of Plows

For many years the question of raising the efficiency by breaking this column, allowing the finer parts to get in contact with the plates as well as increasing the area of contact, has claimed my attention. I have tried ploughs bolted to the screen plates set diagonally, and zig-zag. I have also tried rakes made of flat steel bar standing clear of the plates to which they were bolted on short legs; the idea being to dislodge the fines from the center. This was a slight advance on ploughs. Fig. 2.

The next experiment was to bisect the screen longitudinally by means of a straight screen plate which divided the material into two separate columns, giving results as shown in two positions (Fig. 3). This was an advance on the rake, but the power for driving was excessive. However, on splitting up the screen into three or four divisions, distributing the material around the axis so as to obtain a better working balance, it was seen that the smalls could not escape in a satisfactory manner. I, therefore, arranged the plates as shown in Figs. 4 and 5. A bulkhead was provided in the feed drum with suitable openings to coincide with the oval shape of the screen divisions. A dart plate was also provided in the center, which prevented the siftings from falling on the divisions beneath; these siftings escaped through openings in the circumference. Thus was a single screen converted into a multiple screen without the diameter of the former.

Multple-Jacketed Screens

From this it was but a short step to the multiple screen of round barrels. However, instead of the barrels moving *en bloc* in the system, similar to the oval divisions of Figs. 4 and 5, a separate rotary motion was imparted to each by means of a fixed sun-wheel, into which was geared planets of the same diameter, which latter were connected to the barrels (Fig. 6a); therefore, on revolving the system once each barrel revolved twice in the same direction, the material in each being subjected to two travels of the circumference. On substituting an internally toothed fixed ring, equal to the planet diameter x 3 instead of the sun wheel, in connection with the same spider and planets (Fig. 6b), the system on being revolved once in the same direction (anti-clockwise) caused the barrels to revolve twice (clockwise) in their orbit, the material being treated to the same screening effect as in the former case; there, however, is caused the curious effect of bringing the center of gravity of the material to the descending side of the system, an no matter what the positions of the planets are, in their orbit, the center of gravity, always remains the same, provided, of course, that the quantity of material remains constant and equal in each barrel. The greater the quantity in barrels the closer the center of gravity approaches the center of the system, and *vice versa.* This at first glance looks like perpetual motion, but in practice we find that the same amount of driving power is required in each case. On referring to diagram (Fig. 6c), the same operating forces are shown. The force required on the axis of the ascending cylinder is equal to the load x 2. On the other hand, we find that there is practically no compensating force assisting on the descending side. A very simple experiment will demonstrate this. Get a long canister (a 1-lb. carbide tin will suit) put in some heavy material, such as sand or stone dust, of not more than 25% of its capacity; force has to be applied to make this cylinder roll down a plane surface of 10 deg. It is, therefore, obvious that a much greater force is required to make it roll up hill. Fig. 6d shows that the descending barrel cannot impart motion to the ascending barrel. If the barrels were of greater diameter than the planet wheels, more power would be required, as we find the part of the descending cylinder which contains the load actually moving up hill for the same reason that the flange of a wheel below the tread is traveling in the opposite direction to the axis.

Referring further to the movement in barrels of multiple screens, either round or oval, *en bloc* or planetary, the material on the descending side of the system is always subjected to a slower screening action than on the ascending side. Students of Einstein's theory can hereby see an instance of the combination—Relativity—Gravitation—Motion.

Eliminating the "Roll"

The roll as shown in Fig. 1 was still present in these divisions, aggravated by barrels which of necessity are of small diameter. The problem, therefore, was to get rid of this roll, effectively, and if possible, confine the operation to a single barrel which would allow of elbow room for the inevitable repairs and renewals. This I successfully solved by bolting one limb of a trough to the screen plate, the other limb being held open in the direction of rotation of the screen. As the trough advanced it scooped a portion of the material and held same until it began to descend when it poured its contents gently in advance on to the bare screen plate, thus giving a screening action on two quadrants at same

*Reprinted from *Quarry Managers Journal* (England).

time, and the material was so presented to the plates the "fines" easily escaped (Fig. 7a.).

On fixing three of these scoops at equal distances apart (120 deg.) the whole of the contents of the screen were treated to this double screening, while the power required for driving was practically halved. Choking or clogging of holes, even in plates ¼-in. thick, punched $\frac{5}{16}$-in. holes, is entirely eliminated owing to the to and from motion of the material.

In actual practice a screen 25 ft. by 42 in. diameter, 14 r.p.m. fitted with plates ¼-in. thick, punched $\frac{5}{16}$-in., $\frac{7}{16}$-in. and $\frac{5}{8}$-in., and fitted with three scoops can successfully grade 60 tons per hour of material, direct from rolls or granulators.

Following these remarkable results I decided to patent the invention, and this formed the subject of an application to the Patent Office in February, 1928, which was accepted in due course.

On examining the effect on the material in the outer screen or dust jacket, which usually surrounds the first section of rotary screens, I found that this double screening was transmitted through to the smalls without the addition of other scoops. Scoops however, can be fitted easily by bolting one

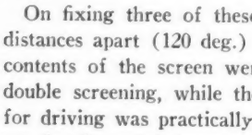


Fig 1

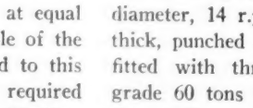


Fig 2.

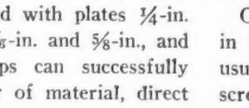


Fig 3 a.

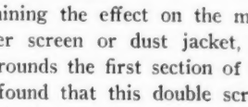


Fig 3 b.

Fig 4 a.

Fig 4 b.

Fig 5 a.

Fig 5 b.

Fig 6 a.

Fig 6 b.

Fig 6 c.

Fig 6 d

Fig 7 a.

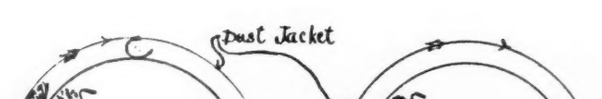


Fig 7 b

Fig 7 c.

Study of the movements of materials in rotary screens. The various illustrations indicate the experimental changes in design made by the author

limb to the plate of main barrel, and the other to the dust jacket. These jackets generally run too fast for best results, owing to their greater radius. A radius 20% greater than radius of main barrel need not be exceeded; the space thus obtained is sufficient to deal with the relatively small quantity in that section. However, if the screen is fitted with T-bars these can be utilized as efficient scoops by fitting the jacket direct to the web and provide a strip of ⅛-in plate as an extension to the leading flange of T-bar. (Fig. 7b.)

All tests for efficiency of the different types of rotary screens can readily be carried out in models rolling on a plain surface, the distance traveled and the amount deposited can thus be easily seen. Flanges, however, should be provided to keep the barrels clear for egress of siftings. The power required can also be compared by tilting the plane until the models roll without additional power; the angle of fall can then be measured with level and protractor. In the power test, however, it is better to fit an elastic band, which on being sprung over the cylinders, effectually prevents material from escaping, thus giving a constant angle of fall. The epicyclic screens, however, cannot be tested without a stand and fixed bearings for main shaft. A drum or pulley on which is coiled a fine string fitted with hook is secured to this shaft; the correct weight (which will be found by trial) on being attached to the hook, supplies the driving power, and this in conjunction with the amount of material delivered will give the efficiency.

Burlington Operates Special Trains for Agricultural Limestone

THE Chicago, Burlington and Quincy R. R. recently announced arrangements to permit operation of special trainloads of agricultural limestone for delivery between stations on the right-of-way. Such trains must consist of 10 cars or more.

The agricultural department of the Burlington railroad has for several years been devoting much effort and attention to the lime and legume program in the railroad's territory. Educational demonstration trains have been operated in recent years in Missouri and Iowa in cooperation with the state colleges of agriculture, which carried soil testing laboratories; the department has collaborated with the colleges in holding many soils meetings, soil testing campaigns; and a great lot of effort has been put in on getting some individual or organization to stock agricultural lime at as many of the railroad stations as possible for the convenience of farmers of the communities. More than 150 communities on the Burlington in Missouri, Iowa and Illinois now have lime on hand and these bins have been a tremendous help in encouraging the use of lime.

There are now more than 2000 carloads of agricultural limestone being delivered in Burlington territory of Missouri, Iowa and Illinois each year. The railroad's agricultural department being keenly alive to the situation, but thoroughly realizing the difficulty experienced by the average farmer in getting the limestone when he wants it, has made this new arrangement as another step to supplement the limestone bins.

Tariffs and Regulations

Carload shipments of agricultural limestone may be stopped to be unloaded between stations on the C. B. & Q. R. R. under the following conditions:

(1) Stopping and unloading limestone between stations under this tariff is for the accommodation of consignee, and as a part of the consideration for such privilege, in addition to the charges herein provided, consignee agrees that he and his employes or men furnished by him, when on or about the trains, cars, engines or right-of-way of the railroad company, pursuant to such special arrangement, are not passengers, agents or employes of the railroad company or subject to its direction or control; that the railroad company assumes no responsibility to furnish a safe place in which to perform any part of said work or to warn or instruct as to the dangers incident thereto; that such work on railroad right-of-way, cars and trains is attended with danger with consignee, for himself and his employes, agents or men, assumes, and against which consignee agrees to warn and instruct his employes, agents or men; and consignee agrees to indemnify and save harmless the railroad company of and from any and all claims for personal injury to, or damage to property of, himself or his employes, agents or men, which may arise directly or indirectly out of any work in connection with the stopping and unloading of limestone between stations under this tariff, whether claimed to have been due to negligence of the railroad company or its agents, or otherwise.

(2) Not less than 10 carloads for any one train must be offered at one time.

(3) Arrangements must be made in advance through the superintendent of division where such unloading is to be performed. This service will be furnished at such reasonable times and places as, in the opinion of the superintendent, operating conditions will permit.

(4) The limestone must be loaded in side-dump cars and each individual carload must be completely unloaded at one location.

(5) Consignee, together with section foreman or other railroad representative, will select and properly mark the unloading locations, and consignee will have such unloading locations cleaned prior to the special movement.

(6) Consignee will have at least two men at each unloading location who will assist in the unloading and see that the tracks are cleared after unloading.

(7) Shipments must be waybilled in regular manner from point of origin to next station beyond the unloading point at tariff rate, plus $6.30 per car (for the privilege of unloading between stations), all of which charges must be paid prior to the unloading.

(8) Consignee will remove limestone from right-of-way as soon as possible after being unloaded, and unless removed within 60 days will be subject to charges.

One of the Burlington's special agricultural limestone trains

Walter B. Remley, agricultural agent of the Burlington, states that many of the railroads in the western trunk-line territory are standardizing on this form of tariff or something very similar to it.

Industrial Measurements*

Weighing

By Everett P. Partridge
Ann Arbor, Mich.

GIFTED FOREMEN used to be able to squint one eye and estimate the amounts of materials going into a batch. Either the trait is dying out and foremen aren't what they used to be, or else the old-time experts were really somewhat less accurate than the legends assert. At any rate, modern technology is no longer content with approximations in measurement. This article describes the developments which have been taking place in the weighing of solid materials in industry, both by manual processes and automatically.

In treating the subject of industrial weighing it will be convenient to take the viewpoint of the application of the equipment, rather than to discuss specifically the mechanical features of all the types of scales available. Some mention will be made of these mechanical details, but no attempt will be made at a complete description of individual scales or at a complete comparison of different types. A simple division may be made, for the sake of clearness, into the weigh-beam and pendulum types of weighing devices. In the first type the weight of an object is transmitted by levers to a weigh-beam, which is balanced by varying either the position or the amount, or both position and amount of weights upon it, while in the second type the weight of the object is transmitted to a lever, which lifts a constant weight in a vertical arc against the force of gravity.

The first type of weighing mechanism may be operated manually, semi-automatically or automatically. In manual operation the load is balanced by hand, and the weight is read and recorded by the operator. In semi-automatic operation the load is balanced mechanically, and the weight is indicated by the machine, but is read and recorded by the operator. In complete automatic operation the machine not only balances the load, but records the amount of the weight by printing on a slip of paper or by actuating the mechanical counter or a continuous recorder of the familiar circular type. The second type of weighing mechanism is almost universally used as a semi-automatic installation, the weight being indicated on a dial and read and recorded by the operator.

With this brief classification of the types of industrial scales for an introduction, attention will now be directed to the weighing problems occurring in manufacturing the products of the process industries. These problems, when reduced to their simplest terms, may be grouped under three heads: (1) weighing of raw materials, (2) compounding and check-weighing, (3) packaging and product measuring. Some typical applications of scales in each of these three fields will be discussed in the following sections.

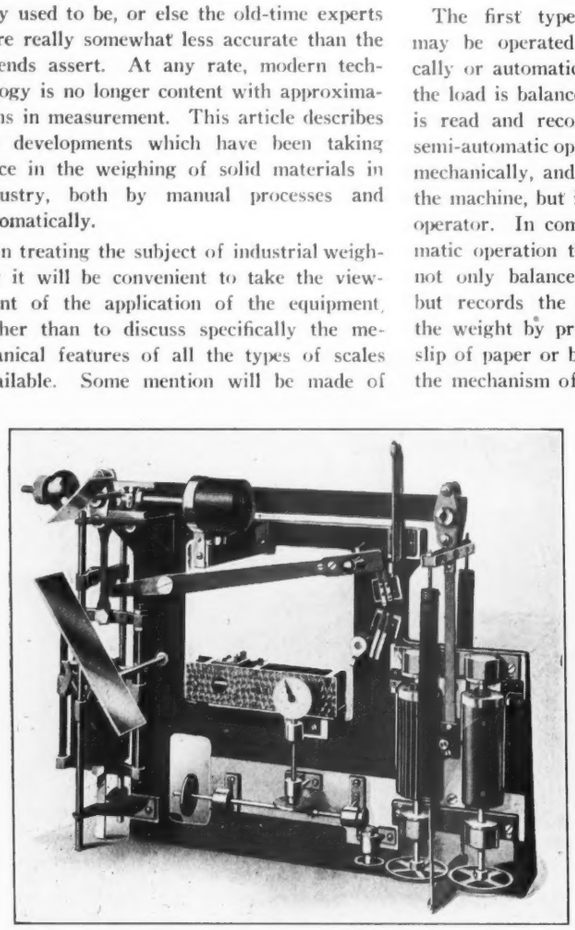


Fig. 1. Integrating mechanism of automatic scale which weighs material in transit

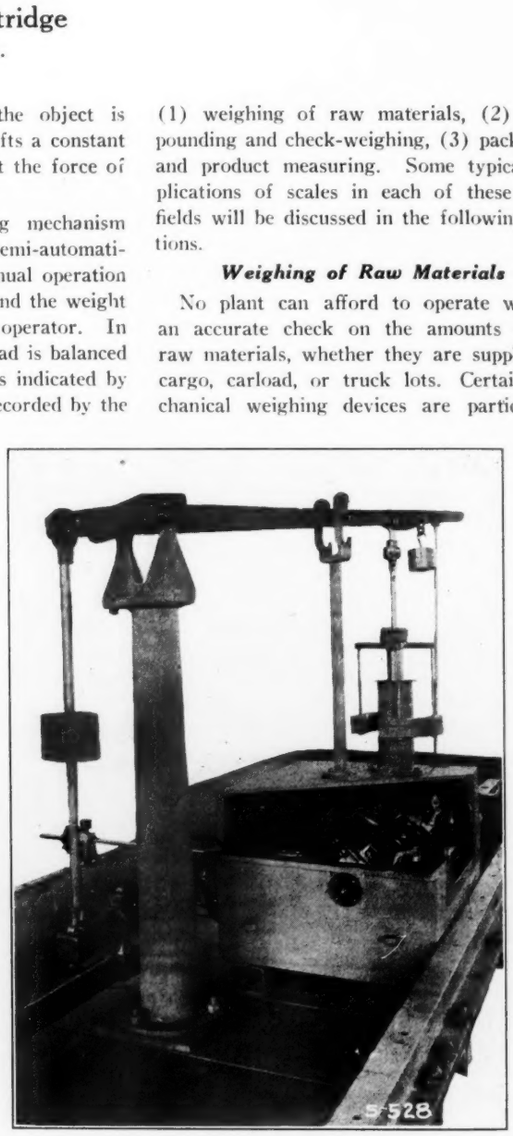


Fig. 2. Integrating mechanism of another type of belt conveyor weigher. The cut-away view shows the device described in the text

Weighing of Raw Materials

No plant can afford to operate without an accurate check on the amounts of its raw materials, whether they are supplied in cargo, carload, or truck lots. Certain mechanical weighing devices are particularly well adapted to this type of service. Hopper scales and conveyor scales will handle a continuous flow of material from transportation to storage, or from storage to process, while scales of the platform type are built in models to weigh batch lots ranging from a loaded freight car down to a wheelbarrowful.

The hopper scales adapted for weighing in raw materials reverse the ordinary process of weighing, since they measure and pass loads of material against a predetermined standard. The weighing hopper is

*Reprinted by courtesy of the publishers from *Industrial and Engineering Chemistry* for August, 1929.

mounted on one end of a lever, which carried at the other end a variable counterbalance which can be adjusted and locked at the point necessary to give a certain weight discharge from the hopper. As the hopper fills with material to the desired weight, it starts to drop. The movement of the lever arms actuates the feed shutoff, while further travel opens the hopper discharge. Relieved of its load, the hopper moves upward again, closing its own discharge gate and opening the feed-gate again. An automatic counter records the number of cycles, and this value multiplied by the standardized weight of a single discharge gives the total weight of material passed through the hopper. Hopper scales are much used on dry materials which will not ball up and cling to the hopper. Some of their applications are the handling of coal, of grain to elevator storage, and of such raw materials as crushed limestone or sugar beets from storage to process.

Conveyor scales differ fundamentally from scales weighing a dead load in that they must integrate the instantaneous weight of the material on a section of conveyor belt against the rate of belt travel. This problem of mechanical integration has produced several ingenious devices. The most recent of these is the electrically operated system of the Telepoise. A short section of the conveyor is suspended from weighing levers working against precision springs. The levers and springs control the position of a contactor, described below, which is connected to a registering device placed at any distance, and to a graphic recorder which shows the flow of material on the conveyor, including all variations and interruptions.

The contactor mechanism of the Telepoise is shown in Fig. 1. The small vertical drums at the lower right revolve toward each other, and are driven directly by chains and gearing from a traction roller riding on the inside of the return span of the conveyor belt. The left-hand drum has a ridged surface, the separate ridges acting as cams to push a contactor suspended from the weigh-beam against the right-hand drum. The latter has a surface half of which is electrically conducting and half non-conducting, the line between the two portions following a true helix. With the belt running, the contactor is pushed periodically several times a second against the right-hand drum by the revolution of the ridged left-hand drum. When there is no load on the belt, the contactor hangs at its lowest point, where it does not touch any of the electrically conductive surface of the right-hand drum. With a load on the belt the contactor is pulled up between the drums, its position being determined by the weight on the belt. The contacts with the conducting portion of the right-hand drum allow the passage of electric current impulses to the register and recorder. Increased weight on the belt raises the contactor, resulting in an increased number of transmitted impulses per unit of time, while decreased weight on the belt lowers the contactor, cutting down the number of transmitted impulses. Similarly, increased belt speed increases the number of contacts per unit of time, because the rate of rotation of the drums is proportional to the rate of belt travel. The number of electrical impulses to the register is therefore a combined measure of the rate of belt travel and of the weight of material on the belt.

The Telepoise can be balanced directly by means of a test weight by merely shifting a lever, which automatically cuts out the recording mechanism and shows by an ingenious arrangement of moving pointer and dial whether the scale is in accurate balance. Another feature is a percentage load indicator consisting of a mirror system so arranged that the movement of the weigh-beam reflects a black line on a large illuminated ground glass calibrated in per cent of full load. This ground glass is set so that it may be observed by the operator controlling the feed of material to the belt.

Another clever integrating device for belt conveyor weighing is included in the Conveyor Weightometer, the essentials of which are shown in Fig. 2. An aluminum disk with small bakelite rollers mounted around its circumference is suspended on a frame so that it can rotate freely and at the same time swing freely on ball bearings between a horizontal and a vertical position. A continuous small belt driven from a traction roller on the belt conveyor is pressed against opposite sides of the aluminum disk by small pulleys. When the disk is vertical, as it is when the conveyor is running empty, the component of the motion of the small continuous belt tending to rotate the disk is zero. When the conveyor is loaded, however, the weight transmitted through the lever systems from the weighing rollers under a section of the conveyor swings the disk from the vertical toward the horizontal position to a degree proportional to the load on the conveyor. In such a position the movement of the small continuous belt exerts a rotating action on the disk, and the rotation of the disk is recorded on a continuous counter. The more nearly the disk approaches the horizontal the greater becomes the component of the motion of the small continuous belt in the direction of rotation of the disk. Since the rate of travel of the small continuous belt is directly proportional to the rate of travel of the conveyor belt, and since the angle of the rotating disk is proportional to the instantaneous weight on the weighing section of the belt, the resultant rate of rotation of the disk is a measure of the rate at which material is being conveyed.

The Conveyor Weightometer weigh-beam is counterbalanced by a cylindrical steel float partially immersed in a bath of mercury. Calibration is accomplished by suspending a test section of roller chain of known weight on the weighing section of the conveyor while the conveyor is running at normal speed. This simulates a constant known load. Adjustment for the weight of the empty belt is made with the conveyor running unloaded.

Platform scales of the automatic type are applicable to the handling of a continuous flow of material contained in small plant trucks, narrow-gage rail buggies, or carriers on overhead monorial lines, the platform in the last case being replaced by a weighing section of the rail mounted on levers connected to the scale mechanism. The automatic weighing and recording is carried out by mechanisms such as the Mechanical Weighman, which utilizes the disk-and-belt principle of the Conveyor Weightometer to operate the balancing weight on a weigh-beam, and automatically records the value of each load on a totalizing counter. The same type of automatic weighing and recording mechanism may also be applied to hopper scales.

Semi-automatic operation of platform scales of the weigh-beam type may be obtained by the use of the Weightograph, a weight-indicating device of the pendulum type, which may be attached to the end of the weigh-beam to face in any convenient direction. The pendulum carries a weight scale, the numbers on which are transmitted to an illuminated ground glass easily read by the operator at a considerable distance.

Manually operated platform scales are useful for handling infrequent loads of material, but are not good practice for large plants operating on a continuous schedule of raw material input.

Compounding and Batch Check-Weighing

For making up small batches of material, as in the compounding of rubber accelerators or of dough in bakeries, small platform scales are used with ungraduated dials showing a center indication and a warning range above and below the correct balance. For larger industrial operations platform and rail scales find varied uses. In several large glass plants the components of the batch are weighed into a special truck running on a track below a line of storage bins, and the complete batch is then check-weighed on rail scales at the end of the run. These special batch trucks are merely containers mounted on platform scales, the whole arrangement being carried in turn on the truck base. Scales of the pendulum type with direct indication of weights on a large dial are used chiefly for this work. If it is desired to keep the composition of a batch secret from the truck operator, the scale dial may be left blank, and adjustable indicators supplied instead, these being fixed at the points on the dial corresponding to the desired weights of the various components of the batch.

Hopper scales are also used for measuring batches of material to processes. Fig. 3 shows in the foreground one of a battery of hopper scales feeding to glass furnaces.

The operation of this type of hopper scale differs from that previously described for the weighing-in of raw materials, in that the amount of material taken into the hopper from the storage bin is indicated directly on the large dial on the operating floor, and this amount is directly controlled by the operator instead of being a constant value. Hopper scales of the type illustrated in Fig. 3 are excellently adapted to any process which requires the feeding of materials in rather large quantities, but at intervals rather than continuously.

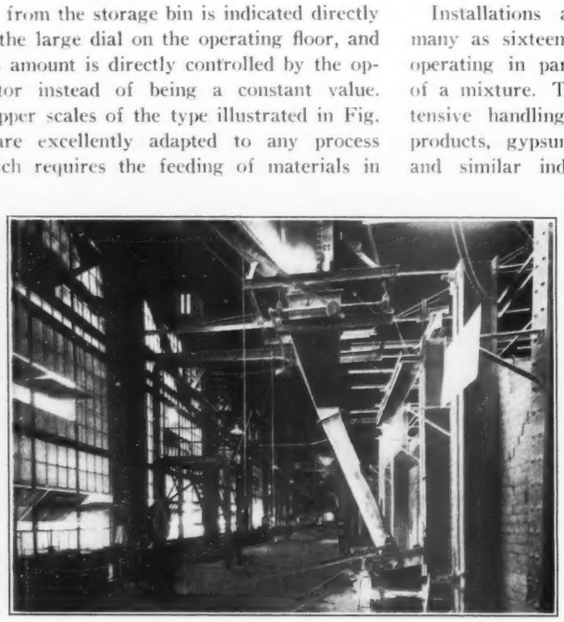


Fig. 3. Hopper scales measuring feed of batch to a furnace. The registering dial scale shows at the left

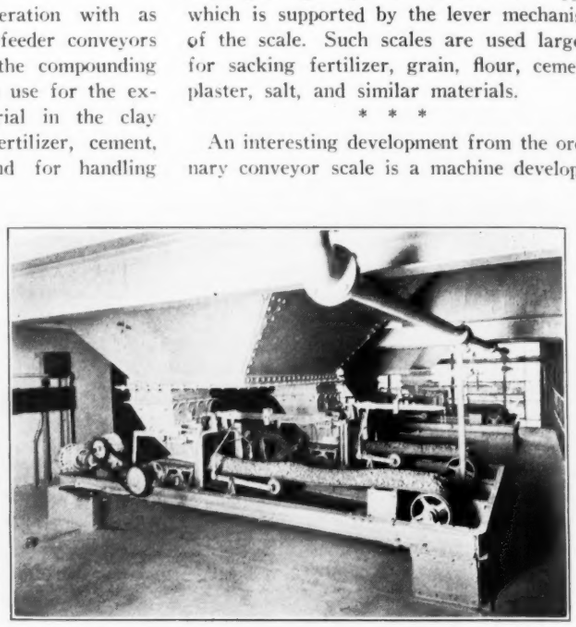


Fig. 4. Material proportioning device at a portland cement mill

Conveyor scales on parallel conveyors, each of which carries one of the components of a batch, offer a check on the input of materials to a continuous process feed, as in the manufacture of cement. Simple conveyor scales are not adapted to controlling the rate of feed of the various components, however. The Poidometer goes a step beyond the conveyor scale and supplies this control. This equipment uses the movement of a series of lever arms, actuated by a section of the conveyor belt, to control the hopper gate feeding to the conveyor. Fig. 4 shows Poidometers arranged in batteries of two each for the purpose of proportioning raw materials in cement manufacture. For operations requiring the addition of definite proportions of water, such as the slaking of lime, a liquid-measuring device may be attached to the Poidometer, which feeds water to the hydrator at a rate that is predetermmied and is controlled by the same mechanism which feeds the lime to the conveyor. Poidometers are particularly applicable to the control of compounding in any process where operation is continuous and dry granular materials are to be handled in large quantities. They are generally equipped with automatic controls which will stop all of the conveyor scales in a battery if any one fails to receive its proper amount of material. Another attachment is provided for batch work which will stop the conveyor scale after a predetermined amount of material has been delivered by it. The amount of material carried is calculated from the setting of the scale weights on the weigh-beam and the distance traveled by the belt, as recorded on a continuous counter.

Installations are in operation with as many as sixteen of these feeder conveyors operating in parallel for the compounding of a mixture. They are in use for the extensive handling of material in the clay products, gypsum, lime, fertilizer, cement, and similar industries, and for handling grain, as well as coal and ashes in power plants. The guaranteed accuracy for normal operating conditions is 99%.

Packaging and Product Measuring

The estimation of the amount of a product from the weighing of the raw materials entering into its manufacture allows too many loopholes for loss in processing to be tolerated by careful engineering executives. The product, not only of the final process of a plant, but also of the different stages in processing, should be checked to make possible the reduction of manufacturing losses to a minimum.

In all of this weighing of intermediate and final products the conveyor scale is important for the plant in which production is arranged on a continuous interlocking basis, and the materials are such as can be handled well in conveyors of the belt, bucket, or pan type. Where plants are built for batch operation, the platform scale for the weighing of hand trucks or buggies, or for adaptation to a simple roller conveyor, is likely to be favored. The hopper scale may also be used at the end of a continuous conveyor as a measuring unit discharging to storage or loading material for transportation.

For products distributed in packages, rather than in carload or cargo lots, there are numerous types of scales adapted for special conditions, such as sacking scales, and package check-weighing scales or difference weighers. Sacking scales are of two types. The first is an ordinary platform scale, the feed hopper being arranged over the platform so that the sack when attached to it rests upon the platform. The other type of sacking scale is illustrated in Fig. 5, the bag being suspended from a feed hopper which is supported by the lever mechanism of the scale. Such scales are used largely for sacking fertilizer, grain, flour, cement, plaster, salt, and similar materials.

* * *

An interesting development from the ordinary conveyor scale is a machine developed for weighing continuously a sheet product such as auto-top material, paper, or rubber tire tread. The strip of material passes over a weighing roller connected to a lever system as in the conveyor scale, and records on a dial the weight of the moving material. Such scales give a constant check on the uniformity of the product. Fig. 6 shows a typical installation and emphasizes the small amount of space required by the actual weighing mechanism. The weighing roller is the small-diameter roller in the center of the illustration, one end of which is supported in a bearing on the weigh-beam.

Important Factors in Industrial Weighing

The chief requisites of an industrial weighing mechanism are accuracy, ruggedness, speed of weighing, and elimination of errors in reading. A very good degree of accuracy may be obtained with any of the types of scales mentioned; conversely, any of these types may become very inaccurate if not consistently checked. In general, the accuracy of most industrial installations should be not lower than 99%. It is stated previously in this article that one type of conveyor scale is guaranteed to meet this standard, while a recent English article (*1*) claims that a good hopper type scale should be accurate to within 0.2% to 0.5%.

Most industrial scales are constructed to stand punishment, but the engineering excellence is likely to vary directly with the price. Particular attention should be paid to the manner of suspending knife edges to eliminate scraping over the surfaces upon which they bear, and to the maintenance of

constant belt tension in conveyor scale installations.

The factors of speed of weighing and elimination of errors in reading are closely related, and are not as in the classic dilemma of efficiency and economy, mutually incompatible. Weighing by completely manual operation is the slowest method and the one which introduces the greatest number of opportunities for error. Semi-automatic weighing, in which the balancing is done automatically and the weight is merely read off by the operator, is a great improvement both in speed and in elimination of errors, but complete automatic weighing, in which the final step of recording the weight is also carried out by the machine, represents the most rapid and foolproof system of all. It is absolutely necessary, of course, that automatic weighing devices be checked frequently to detect possible errors of adjustment, but if this is done they provide an invaluable measuring instrument for the large-scale operation of industrial processes.

The trend in the United States at the present time is predominantly in favor of the automatic handling of processes, because it has been very definitely proved that a machine can always surpass a man at doing anything that has to be done repeatedly. The trend toward automatic equipment is reflected in the replacement of the hand truck by the continuous conveyor, a change which carries with it the replacement of the manually operated scale by the automatic conveyor scale or the hopper type of weighing equipment. Even in plants where transfer of materials is still, for some good or bad reason, carried out largely by hand, the semi-automatic scale is replacing the old-fashioned platform scale where the weightmaster juggled weights all day.

Complete automatic weighing equipment is, of course, not particularly applicable to the small-scale or discontinuous operation. The process in question must involve sufficient amounts of material and labor to overbalance the cost of automatic equipment by the savings in time, labor costs, and accuracy of measurement made by the equipment. Nothing in this article should be taken to indicate that automatic weighing is the type indicated for every industrial problem of material measurement. This article has attempted merely to indicate that the manually operated scale is not particularly applicable to modern large-scale production, and that either semi-automatic or automatic equipment is the better engineering choice.

Acknowledgment

Information supplied by the following firms has been used in the preparation of this article: Exact Weight Scale Co., Columbus, Ohio; Howe Scale Co., New York, N. Y.; Merrick Scale Manufacturing Co., Passaic, N. J.; Ralston Scales Corp., Columbus, Ohio; Schaffer Poidometer Co., Pittsburgh, Penn.; Toledo Scale Co., Toledo, Ohio; E. J. White, Sales Agent, Telepoise Conveyor Scale, New York, N. Y.

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(1) Benton, *Chemistry Industry*, **46**, 741, 764 (1927).

Stripping and Mining Costs of Bauxite and Pebble Phosphate

DURING AN average year approximately 150,000 tons of bauxite and 2,700,000 tons of pebble phosphate are mined by open-pit or stripping methods in the United States, says a recent bulletin (No. 298) of the U. S. Bureau of Mines. The low prices these materials bring makes low production costs a necessity, the report continues, and because of this and repeated queries on methods and costs of this stripping a detailed investigation has been carried out and the results published in this bulletin.

Regarding bauxite, the report states that eventually open-pit methods will give way to underground methods, as at present 60% of the total of 390,000 tons produced is so recovered. There are no difficult problems involved, unless it be drainage and cleaning the surface of the bauxite that has been exposed by stripping. The overburden is easy to dig, but the ore must be shot before loading. The contract price for stripping is 30 cents per yard, which is not high when the several steps in the process are considered.

Pebble phosphate mining has a comparatively simple technique—the use of draglines and hydraulicking for overburden and hydraulic mining of the matrix—suffices to recover 2,750,000 tons of pebble phosphate a year in Florida. The overburden is mainly composed of soil, sand, sandy clay and friable sandstone and is easily stripped. It costs 10 cents per cu. yd. to remove the overburden by hydraulic methods and 15 cents by steam shovel and 15 cents per ton to mine the matrix by hydraulic methods. Stripping and mining costs constitute 57.3% of the total production cost of pebble phosphate in Florida.

The bulletin gives a brief history of strip mining, the magnitude of the industry and a more detailed account of the production and costs of the stripping and mining in the coal, copper ore and iron ore industries in addition to the other industries mentioned above. A chapter is devoted to accident records and safety measures of these industries.

Copies of this bulletin are available at 70 cents per each from the Government Printing Office, Washington, D. C.

Government Potash Exploration

THE American Institute of Mining and Metallurgical Engineers, Inc., has released Technical Publication No. 212, the paper being one read at the February, 1929, meeting at New York City by G. R. Mansfield and W. B. Lang of the United States Geological Survey. The paper is entitled "Government Potash Exploration in Texas and New Mexico," and is a preliminary report covering the findings of the Geological Survey.

Fig. 5. A type of sacking scale used largely for cement, plaster, fertilizer and similar materials

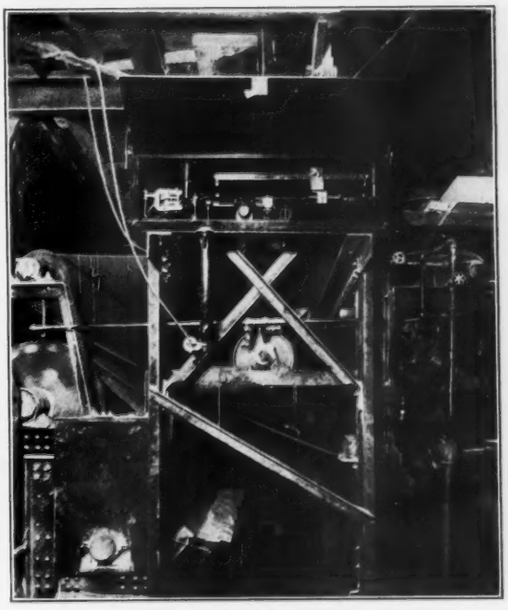


Fig. 6. Continuous scale recording weight and checking uniformity of sheet product at end of manufacturing process

Rock Products Developments in a Seldom Explored Territory

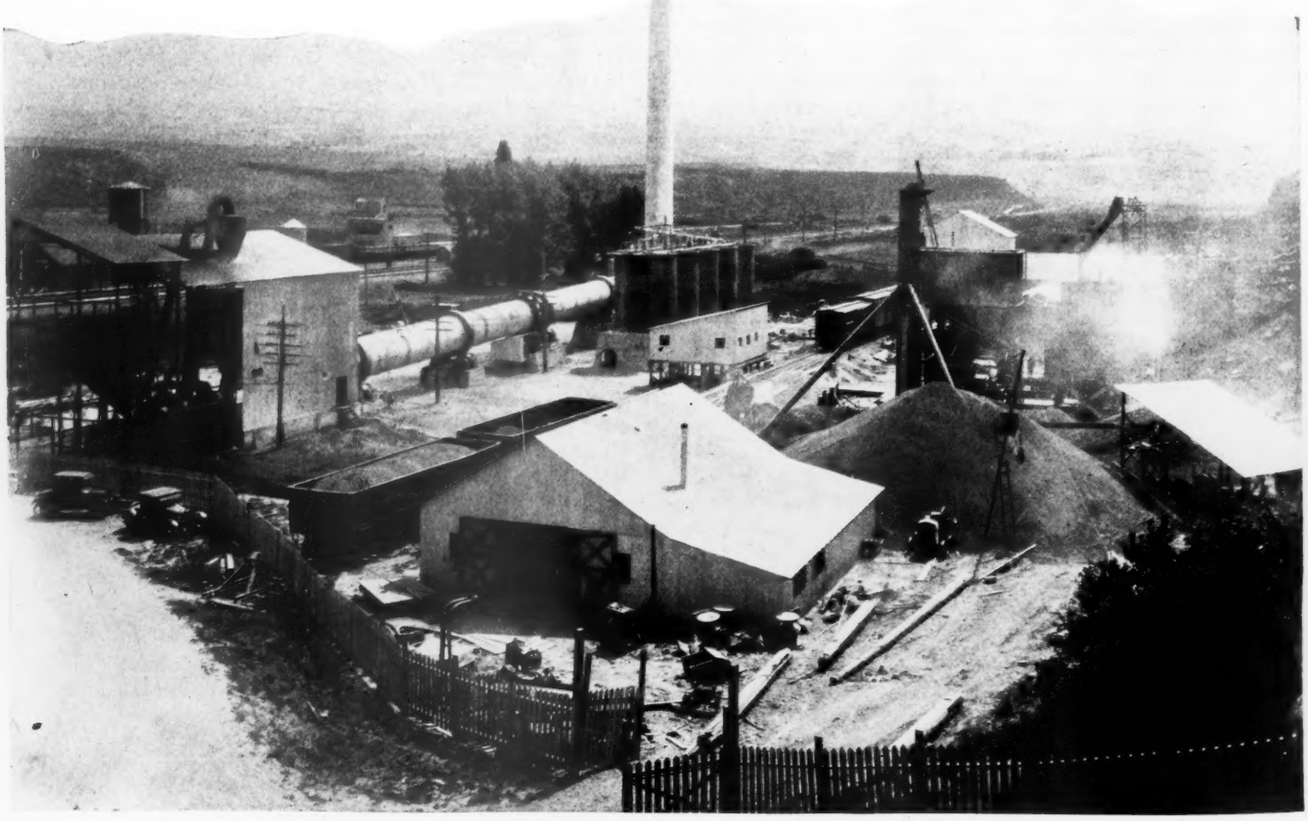
Items of Interest Between Denver, Colo., and Los Angeles, Calif., in the States of Idaho, Utah and Nevada

By Walter B. Lenhart
Associate Editor, Rock Products

GRADUALLY the map of the United States showing the locations of portland cement plants in the various states is being extended until there are only a very few states left within whose borders is not now located a cement plant. The latest state to join the ranks of the producers is Idaho with a new single kiln plant located at In-kom, 12 miles east of Pocatello, on the main line of the Union Pacific railroad connecting Denver and the east with Portland, Ore. Wyoming, a few months earlier, appeared on this map with the new plant of the Monolith Portland Midwest Co., located at Laramie, and rumors are rife in southern California that the next state to fall in line will be Nevada.

Idaho, which has an area larger than the combined areas of Maine, Vermont, Connecticut, New Hampshire, Massachusetts, Rhode Island, Delaware, New Jersey and Maryland, has a population of only 520,000. Formerly it received all of its cement from plants located in Oregon, Montana and Utah, making necessary comparatively long freight hauls. The population is fairly evenly spread over the entire state with no large cities, farming, mining and lumber being the principal sources of income to the inhabitants. All of these industries are still in the truly pioneering stage, so it is not remarkable that a cement plant should be built there, which, too, was built as a pioneer would naturally build one, taking advantage of conditions as they are and using these conditions to the very best of advantage.

The builders of the Idaho Portland Cement Co.'s plant realized that they were pioneering in a large and very sparsely settled state and that its output would be limited until such time as the state's resources would be more fully developed; so the plant was built in exact accordance with these conditions. The builders took what money they had and bought the necessary new equipment for most of the plant, used some equipment that was cheaply available from second-hand sources, made the plant in the open wherever possible and when not possible built in most cases of wood; constructed bins as simply and cheaply as possible of the same material and got to producing portland cement as quickly as possible. As soon as the plant was producing cement they started



The Idaho Portland Cement Co.'s plant at Pocatello, Idaho

rebuilding portions, using their own cement and their own money and when their plans are fully carried out wooden bins and buildings will be replaced with concrete structures. But the all important fact remains that for a few hundred thousand dollars they built a plant that can produce 1200 bbl. of cement per day.

The plant has one 10x200-ft. Allis-Chalmers kiln, coal-fired, using Raymond Bros.' equipment for pulverizing the coal and Compeb mills for both the raw and finish grinding. The wet method is used. A complete description of this plant and the very unusual quarry from which its raw materials come will be published in an early issue of Rock Products. E. J. Simons is president of the company and J. B. Maxfield, general manager and purchasing agent with offices at the plant.

Atlas Sand and Gravel Co. plant near Salt Lake City, Utah—the mountain gravel deposit shows in the background

Salt Lake Developments

As the country traversed in this editorial trip for the most part ranges from semi-desert, mountainous country to the areas that go to make up the great American desert, the populations are so extremely small and scattered that it can be truly said the rock products industries are with a few exceptions still in the "horse-and-wagon" stage. The exceptions are in localities like Salt Lake City and vicinity, where there are located three portland cement plants; or where the commodity being manufactured is of such a nature and value that it may be shipped to the Pacific coast. As illustrative of this could be mentioned the Nephi Plaster Co., with mills at Nephi, Utah; the Jumbo Plaster and Cement Co., Sigurd, Utah; the United States Lime Products Corp., at Sloan, Nev., and several other gypsum companies located in Nevada.

In such a country it might be thought that the sand and gravel industry would find no representation, but at Salt Lake City is located one of the most unusual deposits of this kind that the writer has ever seen, namely, that owned and operated by the Atlas Sand and Gravel Co. This company recently took over the plant and pits owned by the Stauffer Sand and Gravel Co., which adjoined its own, and installed a Sauerman cable excavator which delivers the gravel to a hopper serving one of the longest belt conveyors to be found anywhere. This Stephens-Adamson conveyor delivers the gravel to the screening plant and at the time of inspection the company was working on a 175,000-cu. yd. order for railroad ballast.

Where the deposit is now several miles from the water's edge of great Salt Lake, it evidently at one time was a beach deposit laid down on the edge of a steep coastal range. The deposit is on the side of a mountain several hundred feet high, completely covering its face. There is no term suitable to describe this deposit except to say that there is a mountain of gravel, good clean gravel, all of which is about the size of most commercial stone, ranging from sand to about 2-in., so that crushing is not a serious problem. Once the excavator is hooked up it can handle enormous tonnages without having to be changed and, as there is no overburden to handle, and no waste products, the operation is very cheap. It

U. S. Lime Products Corp. plant at Sloan, Nev., and the surrounding townsite

was said that the installation could handle 3000 tons of gravel per day at a total cost of $30, and the way the bucket was delivering material with but a single operator there is not much to be said to the contrary.

While Salt Lake City is off the beaten trail as far as the crushed-stone industry is concerned, yet at the Salt Lake station of the United States Bureau of Mines was conducted the research work on crushing and grinding by J. Gross and S. R. Zimmerly, which was published by the Department of Commerce, Bureau of Mines, as Technical Publications Nos. 46, 126 and 127, which were abstracted in the July 20, 1929, issue of Rock Products by Edmund Shaw, contributing editor. These researches are fundamental and of greatest importance to the crushed-stone producer, as well as to mining engineers, and should be given serious study.

The sign near the depot hides most of the town of Las Vegas

An overnight ride on the west-bound limited between Salt Lake City and Los Angeles brings one to the much heralded town of Las Vegas, Nev., formerly but a desert town fortunate to have artesian water in sufficient quantities to make the establishment of the division railroad shops of the Union Pacific possible, but now the "biggest little town in the west," all incidental to the dreams of wealth accompanying the construction of the Boulder Canyon dam, 50 miles south on the Colorado river. This district was and still is, for that matter, rich in nonmetallic minerals. Sixty miles northeast of that town, on the Muddy river, are important deposits of silica sand, gypsum, gypsite, salt and kaolin, all of which have at different times in the past been exploited with indifferent success. Some silica sand is being shipped into Los Angeles from that district at present. Between Las Vegas and the Muddy river are large deposits of colmanite, an important borax mineral, which were operated until the past year, as well as several large gypsum deposits.

East of Las Vegas, at Arden, is located one of the plaster mills of the United States Gypsum Co., which until the establishment of that company's new calcining plant near Blythe, Calif., was one of the principal shippers of that commodity into southern California. A short distance from the Arden quarries of the United States Gypsum Co. are those of the Blue Diamond Materials Co., Los Angeles, which has there a crushing plant and ships the crushed gypsum into Los Angeles to a calcining plant. West of Arden, roughly 10 miles, at Sloan, are the lime manufacturing operations of the United States Lime Products Corp., San Francisco, Calif. This company recently took over the plant and quarry of the Nevada Lime and Rock Corp., and since the property has been in its hands the company has opened up important deposits of dolomitic limestone, and now has three shafts kilns burning that product exclusively, as well as two rotary kilns burning high calcium limestone. The deposit of this company, having high calcium limestone with dolomite limestone as a capping, is staggering as to its magnitude, running into the billions of tons. A complete description of this desert and this truly western operation will shortly be published in Rock Products. Still farther west of Sloan, a few miles, the Blue Diamond Materials Co. has a second operation where it has opened up a limestone quarry, shipping kiln stone to Los Angeles for burning in a gas-fired kiln.

Las Vegas and Boulder Dam Prospects

Las Vegas, Nev., is just now on the depression side of what has been a real boom. A boom, which a few short months ago, caused lots on Fremont street, the main thoroughfare of the town, a street of about four blocks of one- and two-story "business" houses, to be sold and resold for thousands. One 40-ft. lot was pointed out that sold for $20,000, and the buyer erected a two-story building on half the frontage and sold the other half for $16,000. I purposely put the word business in quotation marks to emphasize their nature. The most important apparently and at least the most profitable and ranking high as to numerical count are the gambling houses jammed with their tin horns, gamblers and real estate operators waiting for the boom to reappear.

Fremont Ave., the main street of Las Vegas, boom town of Nevada, due to the proximity of Boulder Canyon dam

Knowing the promotional tendencies of the inhabitants of the state of Nevada, it was with somewhat of a shock that I discovered that there were no companies yet organized for the purpose of supplying the Boulder Canyon dam with aggregates or portland cement, and a canvass of nearly all the real estate offices, the local newspaper and other offices where such information might be gained resulted in the questions relative to this subject being met with incredulous looks. Later and more authoritative information was that the government will use, for the most part, granites excavated from the diversion tunnels and other excavations at the dam site. Whether or not there will be sufficient rock for work of this magnitude is questionable, the more so in view of the reports in circulation that the government is to shortly establish a testing laboratory at Las Vegas to test sand, gravel and other aggregates.

Aggregates for Boulder Dam

The desert country in that vicinity is made up of both sedimentary and igneous rocks with the valleys made up of gravels, but for the most part mixed with fine sand and dirt. In the washes, where the gravel is cleaner, the deposits are shallow and of questionable tonnage; and in any event the material would have to be washed, and there would be the rub, for there is a sad lack of water; in fact, outside of the artesian water at Las Vegas or at the Colorado river, there is none. So if gravel were used the material would have to be hauled to either of those places and washed, or water would have to be pumped over long distances through about as rough a country as there is anywhere in the United States.

Unquestionably the limestone deposits of the United States Lime Products Corp. at Sloan are in the most favorable position for furnishing aggregate; they have, as previ-

ously stated, enormous tonnages of a hard limestone available and opened, so that large tonnages could be produced. With proper crushing and screening facilities a clean product could be made without washing. Incidentally the proposed switch connecting the main line of the Union Pacific with the dam site will take off at a point a few miles from this deposit.

The Arrowhead trail, connecting Los Angeles with Salt Lake City, passes through Las Vegas and to the west of Las Vegas is paved for the most part with asphalt. The General Construction Co. of Las Vegas still operates intermittently an asphalt plant there as well as a small sand and gravel plant supplying building materials for local use. This producer hauls his gravel from the desert in trucks to the plant, some three to four miles, where it is screened and washed. The output is small and represents the entire aggregate industry of that desert town.

The boom that Las Vegas has just experienced was premature, and the time that has elapsed with actual construction work on the dam not started, has been too long to make the boom have any real basis; but the stage is all set for another boom as soon as construction work actually starts. There will be plenty of labor of all kinds available when construction starts, men who have toiled in Nevada's mines and know what to expect.

The only aggregate produced in Las Vegas comes from the plant operated by the General Construction Co.

Dewatering Clay Suspensions by Electrophoresis

VARIOUS methods for removing water from clay suspensions or "slips" have been tried at the Northwest Experiment Station of the United States Bureau of Mines, Seattle, Washington, in co-operation with the University of Washington. The potter's filter press is the most commonly used in this country. Heated pan dryers are used for English china clay; rotating, steam-heated cylinders onto the surfaces of which the suspension is spattered, are used for drying Georgia ochers; continuous, rotary suction filters can be used for the more non-plastic suspensions and slimes; rotary suction filters in combination with steam-heated cylinders are coming into use for pottery clay bodies, and one spray evaporator is now used for Florida kaolin. Some study has been made of the filter press and the spray evaporator at this laboratory and work is now under way on the electrical method.

Patents were originally issued in 1903 by the United States to Count Botho Schwerin of Germany for dewatering peat by electricity, but at the present time it is understood that only one commercial plant is in operation on clays in Germany. The process has also been suggested for dewatering cement slurries before calcination.

The operation consists of passing a direct current through the suspension and providing a mechanical means of removing the damp mass from the electrode upon which the particles collect. Clay particles suspended in water carry a negative charge and will pass to the anode, which is a cylinder of type metal rotating slowly through the slip. The cylinder collects a plastic coating of clay while immersed and is scraped clean during the exposed part of its revolution. When the clay suspension is renewed as fast as used, such a machine provides a continuous and mechanical method of dewatering. This has been the handicap of the common, hand, filter press. With the best acting clays, the water content has been reduced until the clay is in the plastic working condition suitable for molding pottery or other ceramic ware. Further removal of water to bring the clay to the dry condition must be accomplished by evaporation.

A few tentative indications have been noted by the Bureau of Mines investigators as a result of tests of several clays in a small machine. These are as follows:

Different clays exhibit individual characteristics under the influence of an unidirectional electric current. This action is probably related to the same properties which influence the plasticity and working ability of the material and may be a useful method for classifying clays.

Thorough dispersion seems to be an essential requirement for good results. The addition of an alkali increases the dispersion and activity of the clay particles and causes a faster movement toward the anode.

The addition of an acid coagulates the particles into clusters and retards the movement, but with the clays investigated did not cause them to reverse their direction of travel.

Florida kaolin, a plastic type of china clay, was dewatered satisfactorily, while one brand of English kaolin, representing one of the weakest china clays, gave very poor results.

The most efficient operation with the small machine used was obtained when the clay suspension was not depleted below 15% solids.

The attractive office building of the Atlas Sand and Gravel Co., at Salt Lake City

Proceedings of the 1929 Crushed Stone Convention

BOUND COPIES of the full proceedings of the 1929 convention of the National Crushed Stone Association are now available. All the papers and discussion, committee reports, etc., are presented in detail in this book which is a valuable reference for every one interested in the rock products industries. The convention registration and a list of exhibitors is appended.

The value of the papers and addresses is such to warrant every association member ordering a sufficient number of copies to place with its executive officers, engineers and superintendents.

Copies can be obtained at $2 per each from J. R. Boyd, secretary, N.C.S.A., Merchandise building, Washington, D. C.

The A. S. T. M. Symposium on Concrete Aggregates Reviewed

A Digest for the Aggregate Producer

By Edmund Shaw
Contributing Editor, Rock Products

CONCRETE AGGREGATES received a large amount of consideration at the recent American Society for Testing Materials meeting, as an entire session was devoted to an "aggregate symposium" and a considerable portion of the report of Committee C-6 (concrete and concrete aggregates, Cloyd M. Chapman, chairman) was devoted to aggregate research. Comparatively speaking, not so much that was new was brought out about concrete aggregates, but there was a great deal of scattered information brought together and arranged and correlated. There was a disposition in one or two of the papers to go cautiously and avoid controversial points, which may be a pleasant course to follow, although we will never get anywhere in research if we are afraid of stepping on someone's toes. And best of all there was a frankness on the part of those who may be considered authorities to acknowlege that "research in aggregates has hardly started and that much information is needed to give the users the needed assistance," as the chairman, R. W. Crum, said in his introductory paper.

Inspection of Aggregates

Mr. Crum's paper is intensely practical and of the greatest interest to the aggregate producer. In almost the opening sentences he spoke of the vexing matter of who shall pay for aggregates which are rejected after they have passed the usual inspection. And he laid down the rule that what the buyer's inspector has passed the buyer should pay for (unless, of course, there is evidence of fraud or collusion). If this can be made the universal rule it will mean a little more money in the pockets of producers and, what is of much more importance, it will save a lot of vexations and annoyance. Taking the industry as a whole the amount lost in this way cannot be large, and the producer often pockets the loss rather than run the risk of losing future business. But this makes bad feeling and a desire to get even that often leads to trouble. It is a nuisance that ought to be abated, and it is to be hoped that Mr. Crum's indorsement of the rights of the producer will help to abate it.

Regarding the other vexing question: Where shall inspection be made? Mr. Crum says that it depends on the nature of the deposit mainly. "If the natural supply is variable in quality, it will generally be more satisfactory and economical to inspect aggregates at the producing plant," is the way he put it, but he thinks inspection on delivery should be sufficient where the natural material is uniform. And he notes that if the producer is faced with costly rejections the consumer may expect a higher price level, and in such situations he thinks that "the consumer should assume the obligation to pass upon the material before haulage charges accrue."

This seems to be about all that producers have contended for, and all they should ask for by right, and it is pleasant to have it come from such an authority as Mr. Crum, who knows all sides of the concrete highway industry.

Methods of Inspection

A. S. Rea's paper on inspection methods bore down on the necessity for material surveys to be made before any large and important work is begun. This is advisable and there probably will be more of such surveying done in the future than has been done in the past. We are slowly coming to realize that aggregates differ widely and that the differences may be greater between two aggregates of the same material than between two different materials. In fact the difference between two materials may be nil, as between crushed limestone quarried from rock and crushed limestone from gravel, as was brought out in the recently reported tests of the U. S. Bureau of Public Roads. So it will not be surprising if the engineer examines the source of supply in the future even more carefully than he has in the past.

The remainder of Mr. Rea's paper discussed the standard methods of sampling, and the best thing in this part of it was his insistence on the necessity of getting a fair sample from a car or stockpile and his discussion of the ways of doing it.

Fine Aggregates

H. F. Gonnerman's paper on fine aggregates the writer found extremely satisfying from the thorough way it covered the subject. The historical references have more than an academic interest these days, when aggregates are being studied so intensively and so much information old and new has to be collected and correlated. Vitruvius' addition of powdered brick to increase the fines agrees with the findings of Merkle given further on in this paper and those of Pearson given in the paper that follows, and his experience gives weight to the evidence, even though he set it down 2000 years ago. And Gilmore's advice to choose a sand with a low percentage of voids, or to make one by mixing sizes, seems pertinent in the light of modern research.

Mr. Gonnerman admits, as some other investigators have not been willing to do, that fine aggregates have a somewhat different function from coarse aggregates, for he says that "fine aggregate assists the cement paste to float the coarse aggregate particles, thus giving workability to the mass and preventing segregation of coarse aggregates from the paste." It is an old question whether concrete consists of coarse aggregates embedded in a mortar, a "kind of special masonry," or is a mixture of cement paste with aggregates in a gradation of sizes from the finest to the coarsest. The above sentence would look as though the author of the paper inclined to the former view, which is held by other authorities he quotes later.

The mineral composition of sands he holds important and since the paper was published the U. S. Bureau of Public Roads tests (see Rock Products, July 6, 1929) have shown that the mineral composition of aggregates is of greater importance than was suspected even, by most previous investigators. Regarding soundness he speaks of the failure of the sodium sulphate test to detect unsound particles in sand. It would seem that the U. S. Bureau of Public Roads wear tests of sand reported by Woolfe might well have had a place here, since they seem to have demonstrated a fairly close connection between abrasion as shown by the test method and the soundness of sands.

Effect of Silt and Stone Dust

Regarding cleanliness the paper says that the 3% limit set for silt is conservative, which is correct. No one seems to know anything definite about the effect of silt on the strength of mortars and there is plenty of evidence to prove almost anything concerning the relation. The present writer once charted the silt contents and strengths

of a number of sands of about the same fineness modulus, which had been made into 1:3 mortars, taking the data from state highway department reports.. Not even the most biased observer could have found any consistent relation. But he recalls some tests of a New Jersey sand, in which the effect of raising the silt content slightly, apparently had a marked effect in lowering the strength. And yet the tests given in Pearson's paper which followed Gonnerman's showed that sands with the highest silt content were the stronger.

Of course this is no argument for using muddy sand that will cause laitence and be otherwise objectionable, but it is an argument that the effect of silt, dust in crushed stone and some other fine materials in concrete is a subject that is worth more study. Results are too inconsistent now to permit any general rule to be laid down. But in the meantime it will be wise to hold to the conservative 3% limit and to see that it is enforced.

Discussing the stone dust the paper quotes Abram's finding that dust up to 10% does no harm so long as the concrete is *well mixed* and of a proper consistency. Probably the mixing is the key to the divergent results found by different observers. Goldbeck has investigated the matter so thoroughly (Rock Products, February 2, 1929) that his findings ought to be conclusive. The experiments were made on three different stones and they all showed that the effect of 1% of stone dust was less than 2% on the modulus of rupture and less than 1.3% on the compressive strength. Quarry dirt, as pointed out by the present paper, is an altogether different thing from stone dust and it should always be eliminated.

Stone and Slag Screenings

The paper contains a table of screenings from various crushed rock and slag plants giving the grading, specific gravity, silt content and other characteristics. It is probable that every specimen could be almost if not quite matched by a specimen of natural sand from somewhere in the United States, even to the heavy crushed trap rock screenings (123 lb. per cu. ft.). This brings out that the main difference between screenings and sand is that of the rougher surfaces and more angular particles found in screenings.

These are properties which seem to be of greater value in coarse aggregates than in fine, for the recent U. S. Bureau of Roads tests and others show rather certainly that they make for a higher value of modulus of rupture. But in fine aggregates they call for a use of more water and more cement, where the concrete is designed to a fixed water-cement ratio, according to the paper. Which is to say that, other things being equal, screenings make a somewhat weaker mortar than natural sand. Taking an average of all natural sands and all screenings this is probably true. But it seems unfair to let such a generalization go without pointing out some important exceptions. There are plants, especially some large ones in Ohio, where limestone screenings are carefully prepared by washing and grading to make a fine aggregate that is as satisfactory as a high grade natural sand in both workability and strength. It is probable that more of such material might be produced if sufficient study were given to methods of preparing screenings for fine aggregate purposes. In one plant such study has made a highly satisfactory fine aggregate from screenings that gave only unpromising results before preparation. (See Rock Products, December 22, 1928, p. 166.)

Regarding the grading of sands, the paper reviews briefly the work of Ferét, Fuller and Thompson, and Talbot and Richart and more fully the less familiar work of Graf and Merkle. Ferét found a mix of two parts coarse material with one of fine, including the cement, and the least possible amount of medium sizes, gave the most advantageous mortar. Judging from recent work on the relation of grading on voids, this grading was advantageous because of its low voids. Graf's grading (including the cement) calls for 25% passing 0.24 mm., 35% passing 1 mm., 65% passing 3 mm. and 100% passing 7 mm. (a little over ¼-in.). The paper notes that Graf believes the strength of concrete is determined primarily by the strength of the mortar and that his tests have shown that the highest flexural and compressive strengths are obtained in proportion as the gradation corresponds to the above.

H. F. Kriege (Rock Products, December 22, 1928) studied the effect of the gradation of the fine aggregate on the strength of the concrete and found that "it was possible to vary the compressive strength of concrete at will by a relatively small change in the sand used, and entirely within the specification limits." His research also developed that what might be the best sand to use with the rounded particles of gravel might not be the best to use with the angular particles of crushed stone.

This and the references above suggest the advisability of studying the grading of the sands used with both gravel and crushed rock to determine the effect on the flexural strength of highway pavement concrete. Certainly the flexural strength depends largely on the strength of the mortar and this on the grading of the fine aggregate. Any information that would show how the flexural strength could be increased, regardless of the coarse aggregate used, ought to be welcome so long as pavements have to be designed with such a narrow margin of safety—or none at all.

The graphs in Gonnerman's paper are excellent and give clearly the relations between the gradation of the sand and the consistency as shown by the slump. It took 9 gal. of water per sack to give 1:2:4 concrete with fine sand (0- to 48-mesh) a 4½-in. slump. The same slump was obtained with less than 6½ gal. per sack when 0- to 4-mesh sand was used. The strength of the first concrete was 2000 lb. and of the second almost 5000 lb. But a more interesting and less understood relation is shown by the use of a sand with grains of nearly uniform size, 14-mesh to 8-mesh. This was so harsh that the strength fell more than 500 lb. below the others for the same water-cement ratio. The paper concludes from these tests that it is necessary to have all sizes from the very fine to the maximum for the best grading.

Gustav Merkle, a German authority, is quoted at some length to show that impermeability and compressive strength go together and both are dependent on the water-cement ratio. This ought to be true from the mortar-voids theory. The need of sufficient fines is brought out, but the danger of too many fines is also shown. Excess increases permeability by making a leaner mix and increasing the water needed for plasticity. (It may also increase voids.) The paper concludes that for workability sufficient fines are necessary, and that if they are deficient increasing the sand content will not promote workability or prevent segregation except in rich mixes. But it is interesting to note how much opinions differ on what should be the minimum of fines (minus 50-mesh) allowed, according to various specifications which the paper quotes. The variation is from 2% in the A. S. T. M. specifications to 10% in the joint committee specifications.

Fine Aggregate for Mortar and Plaster

Fine aggregate was also discussed in J. C. Pearson's paper, but from a different viewpoint, its adaptability to making plasters and mortars. He holds that for both mortars and plasters the essential properties in the order of their importance are (1) plasticity, (2) reasonable freedom from the soluble salts that effloresce and (3) a fair degree of strength and hardness. Strength is, in fact, a minor consideration as compared to the others. Unfortunately, the paper says, it is the only one that can be measured with accuracy, and the paper admits that "we are quite in the dark without definite information on the general relations between characteristics of fine aggregate and the important properties of shrinkage and plasticity in mortars."

The A. S. T. M. specifications for lime and gypsum plastering sands were examined and the work that led up to them was explained. The paper notes the wide variations permitted in size and gradings, which were not wide enough, however, to include some sands that experience has shown to be suitable for plasters. Then he details the results of tests made in the Lehigh Portland Cement Co. laboratories using the plastic mortar method described in E. M. Brickett's paper of the 1928 meeting. The results of

these tests show only one ground for comparison, that of economy. For equal plasticity, as shown by the flow table, the cement content varied from 31 to 42 lb. per cu. ft. of mortar.

Nevertheless, there were many interesting relations brought out by this series of tests and perhaps the most startling was that of an increased strength with increased *silt* content. This is shown in the graphs accompanying the paper, but it is even more striking if some of the results are arranged in table form:

Sample	Silt %	Compressive strength
C.	0.2	5100
K.	1.0	5660
R.	2.0	5610
N.	3.0	5300
P.	4.2	6550
O.	5.2	6010
G.	6.4	6220
J.	7.6	6580
F.	8.4	7210

Of course there are exceptions but the trend is undoubtedly there.

The paper says that the probable explanation is that the silt behaves as a powdered admixture and has a capacity for absorbing water, greater than that of the aggregate itself. Thus it reduces the *net* water-cement ratio and gives a higher strength.

If the silt were dry, or partially dry, as it would be in a laboratory sample, this explanation would suffice. If it were *wet*, mud saturated, or nearly saturated, with water, as it usually is in commercial sands, then no such effect would take place. The silt content then would be a source of weakness rather than of strength. For the sake of producers who are fighting to maintain a low silt content and who believe their sands to be better than the muddy stuff dug out of a pit beside the road, this matter of the effect of silt should be cleared up.

Quality of Aggregates

F. C. Lang's paper on the quality of coarse aggregates collects data from twelve sources and arranges and analyzes them. At present this is as important as any form of research because the literature of aggregate research is so scattered and so scanty. The qualities investigated were structural strength, absorption, shape of grains and surface texture.

His conclusions agree in the main with the most recent experimental work of the kind reported, the U. S. Bureau of Public Roads tests (see Rock Products for July 6). He finds that the percentage of wear ordinarily has no relation to the strength of concrete, although he points out, as did the report of the tests referred to, that very high abrasion loss would indicate so low a structural strength that the concrete strength would be affected.

He gives his own work on absorption, which shows that if the absorption of the aggregates is satisfied it does not affect the strength of the concrete particularly. It is an advantage sometimes to have absorptive particles in aggregates to reduce the net water-cement ratio, but it must be a variable advantage, as the absorption would be less on rainy days than on dry days. However, there is always the advantage of better curing where the mortar is in contact with the water held by the pores of the coarse aggregate. There is nothing in the tests, of course, that can show this effect, but it is one that might considerably influence strength in practice.

Regarding shape of particles and surface texture, the paper says that the evidence is too limited to warrant any conclusions. Definite determinations of the effect of these factors have not been made, but from the Bureau of Public Roads tests referred to (published since the paper was written) and some others, including Mr. Lang's own work, it seems there is now enough to conclude that angular shapes and rough surface textures favorably affect flexural strength.

Mineral Composition and Permanence

The paper by F. R. McMillan and George W. Ward, on the influence of the coarse aggregates on the durability of concrete, dealt largely with the geology of concrete aggregate materials. It is full of geological terms but the engineer is warned that if he is to use the geologists' information he must learn to speak his language. It is evident that he can afford to and that the aggregate producer can even more afford to, as he is nearer the source of supply than the engineer.

This paper is also a review and many of the references cited should be familiar to Rock Products readers, as they have appeared in this paper either originally or in abstract form.

Some of the statements might open an argument, as the statement that trap rocks and granites "are considered by some to be superior to the best limestone." That may be true enough, but durability is only a relative term and limestone concretes have shown themselves to be durable enough for anybody's use, especially in these days when we build with no idea of using a structure for more than a few generations instead of a thousand years or more.

Feldspar is noted as occasionally a source of danger in igneous rocks because it weathers so easily. In the failure studied by Pearson and Loughlin, mentioned in the paper, the feldspar was already weathered before it was used in concrete. The writer's recollection of Lord's work on feldspar in sands, in the Bureau of Public Roads tests, is that only weathered feldspar gave unsatisfactory results. In other words, it appears to be not feldspar but the clay minerals resulting from its weathering that are dangerous.

It is the clay minerals that have always caused the trouble where limestone concretes have failed and the paper goes into their discussion quite deeply. Dr. Loughlin's paper published in Rock Products, May 12, 1928, is abstracted for a good portion of it. Pyrite and other sulphides are also pointed out as dangerous.

After reading this part of the paper one feels certain that the producer who thinks of opening a quarry in an unproven deposit would do well to have a geologist or a petrographer examine it for minerals that would be likely to cause disintegration. Neglect of this precaution has been responsible for more than one failure in the quarry business, and engineers are getting more particular about the qualities of aggregate every day.

Chert has been the source of much argument, although there can be no argument about certain surface failures resulting from unsound chert in Missouri and a few other states. The discussion in this paper concludes with Kriege's statement that cherts are not all unsound and those that are unsound may be recognized by irregularities of texture and firmly embedded foreign crystals, such as pyrite.

The paper is one that ought to be read and studied by every producer of crushed rock.

Fire Resistance

S. H. Inberg's paper on the fire resistance of different aggregates groups them about as previous tests have done: (1) Calcareous aggregates, (2) feldspathic aggregates, (3) aggregates of granite and sandstone, and (4) highly siliceous aggregates. But in addition there are considered the effects of form and size, the effect of impurities and mixtures and the application to structures and the protection of the concrete, all of which are apparently as important as the type.

The point that should most interest producers is that aggregates of less fire resisting quality may be applied and protected in such a way that the effect of fire will be minimized.

Flat Pebbles and Lignite

Two papers attached to the aggregate committee's report are of special interest to sand and gravel producers. The first by Walker and Proudley on the effect of flat pieces in gravel has been already briefly abstracted for Rock Products. It shows quite conclusively that flat particles do not decrease either the compressive strength or the flexural strength of concrete for ordinary mixes.

This is so very different from the ordinary opinion that the writer wrote Mr. Walker mentioning the widespread prejudice against flats in gravel, and asking if he did not know of any evidence the other way. Mr. Walker replied that he thought the flat shape was usually associated in the mind with weak structural strength, but that there was no evidence of which he knew that flats *per se* made weaker concrete than rounded pebbles.

In other words, the objection to flats is a prejudice unsupported by facts. Probably

it arose because the weak pebbles, those of shale, slate, schist, and so on, are flat. But there may be flats of very strong stone. The writer recalls seeing some aggregates in Texas which were almost all flat flints and they made concrete of very high compressive strength.

The second of these papers, by P. J. Freeman, deals with the effect of lignite coal and soft coal in sand for concrete. He finds that wherever there is a marked coloration from the presence of lignite or decomposed soft coal there is a loss of about 8% in the tensile and compressive strengths of the mortar made from such sand. The loss is fairly constant for amounts varying from 0.05% to 1% of lignite or decomposed coal.

This confirms other investigators fairly well. The loss in strength is not so important in actual practice as the "pop outs" that occur on the surface of concrete containing pieces of lignite of around ¼-in. or so in size. These may be all removed by two or three classifying devices that are now on the market, so a satisfactory sand can be produced even though considerable lignite is present.

Uses of Fuller's Earth

FULLER'S EARTH is used mainly as a filtering medium in clarifying or bleaching fats, greases and mineral and vegetable oils, according to the United States Bureau of Mines, Department of Commerce. Its original use was in fulling woolen cloth, and from that it derived its name, but such use, at least in this country, has almost been abandoned. Fuller's earth is also said to be used in the manufacture of pigments for printing wall paper, in detecting certain coloring matters in some food products, as a substitute for talcum powder, and in medicine as a poultice and as an antidote for alkaloid poisons. Another suggested use is in deliming hides in the manufacture of leather. It has been stated that the fuller's earth cake from oil mills can be used in the manufacture of hand soaps, concrete waterproofing and asphalt preparations.

Fuller's earth was first discovered in the United States in 1891 near Alexander, Ark., by John Olsen. The mineral was used for a time by the Southern Cotton Oil Co. at Little Rock, Ark., but its use was finally abandoned. The real beginning of the industry in this country, however, was in 1893 near Quincy, Fla., when quite by accident, in an unsuccessful effort to burn brick on the property of the Owl Cigar Co., an employe called attention to the close resemblance between the clay used and the German fuller's earth. This discovery in Florida caused considerable excitement, and deposits of fuller's earth were reported from a number of states, but the material in most of these deposits was found to have no value as fuller's earth. Production began in Florida almost immediately after the discovery, and from 1897 to 1899 fuller's earth was produced in Florida, Colorado, New York and Utah. Florida maintained its rank as the leading producer continuously until 1924. In 1901 Arkansas again became a producer. From 1904 to 1907 Arkansas was the second largest producer, but no production of fuller's earth has been reported from Arkansas since 1922. Fuller's earth was found in Georgia soon after the discovery in Florida, but Georgia did not become a producer until 1907, when it ranked third as a producing state; it ranked second from 1909 to 1923, except in 1918 and 1919 when Texas was second; and since 1924 it has ranked first. In 1904 Alabama and Massachusetts, in 1907 South Carolina and Texas, in 1909 California, in 1918 Nevada and in 1922 Illinois and Pennsylvania first appeared as producers.

A statistical report on the production of fuller's earth in 1927, prepared by Jefferson Middleton, has recently been published by the United States Bureau of Mines.

Large Quantities of Limestone Used in Metallurgical Industry

ENORMOUS QUANTITIES of limestone are employed in modern metallurgy, particularly for fluxing, says the United States Bureau of Mines, Department of Commerce, which has recently conducted a study of the subject. Approximately 24,000,000 tons are so used in the United States annually, chiefly in the smelting of iron ores in the blast furnace. Smaller amounts are used in basic open-hearth steel manufacture and in smelting lead, copper, and other nonferrous ores. As limestone enters largely into metallurgical operations, an intimate knowledge not only of its utilization but also of its occurence and qualities, and of the methods of mining and preparing it, is essential to the highest development of metallugical practice.

Most limestone producers have little knowledge of the way in which their stone is used in metallurgy. The maximum content of silica, alumina, sulphur, and possibly magnesium and the minimum content of calcium carbonate may be arbitrarily fixed for the guidance of the producer; but aside from these requirements little information is available to producers on how their stone is used, the office it performs in smelting, or the effects of impurities. More complete knowledge of utilization would enable limestone operators to solve their production problems more intelligently.

On the other hand, the metallurgist's knowledge of conditions governing limestone production is usually limited. The literature of metallurgy is notably lacking in comprehensive discussions of fluxing or furnace stone. Approximately 900 lb. of limestone is used for every long ton of pig iron produced in the blast furnace; but this important constituent of the charge receives comparatively little attention.

Wider information on the origin and occurrence of limestone, on quarrying processes, and on methods of separation from impurities would undoubtedly be an advantage to the furnace operator. A lack of appreciation of modern production methods has in some instances led to decisions that worked a hardship on the fluxing-stone producer without any advantage to the metallurgist. For instance, there is a deep-seated prejudice against limestone fines because in open-pit quarrying the sand and clay impurities are concentrated in the fines. Some stone producers who obtain their stone by underground methods have found great difficulty in convincing furnace operators that their fines are as pure as lump stone.

The purpose of Bulletin 299, "Metallurgical Limestone," just issued by the Bureau of Mines, is to cover as completely as possible the present knowledge of the utilization of metallurgical stone and the problems connected with its quarrying or mining and preparation. With this object in view, it is believed that a clear coordination of all the factors involved may be worked out, and that mutual advantages will ensue to all.

In Bulletin 299, the author, Oliver Bowles, mineral technologist, Bureau of Mines, discusses the utilization problems of metallurgical limestone in both ferrous and nonferrous metallurgy. With regard to its use in the iron blast-furnace, attention is given to the purpose of flux, the action of flux in the furnace, the effects of impurities on fluxing stone, the slagging effect of magnesia, the effect of magnesia on slag viscosity and slag utilization, and other matters. The use of limestone in the smelting of copper, lead and antimony is described. Production problems of fluxing limestone are given attention, and the magnesium problem is considered.

Usually the quarryman prefers a single market, all the details of which he thoroughly understands, for his product, says the author. A diversity of markets requires an additional sales force and a knowledge of the requirements of other consuming industries. However, conditions may be such that a diversity of products is unavoidable. Stone unsuited for metallurgical use may be so interbedded that its removal becomes a necessity, in which case it is highly desirable that a market be found for it. The crushed-stone and railroad-ballast industries may constitute favorable outlets. At practically all fluxing-stone quarries there is a surplus of fines. With suitable grinding equipment the fines may be prepared for the agricultural limestone market or for the filler trades. Coarser materials may be sold as chicken grit or as limestone sand in localities where silica sand is not abundant.

Metallurgical limestone is itself a by-product at many limestone quarries. Thus, in the Toledo district of Ohio many thousands of tons of dolomite too small in size for calcining to lime in shaft kilns are sold to metallurgical plants for furnace lining.

The Determination of Iron Oxide in the Cement Mill Laboratory

By Robert R. King

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ALWAYS, the determination of iron oxide has been a problem to the chemist in the cement-mill laboratory. Some chemists do not consider it necessary to make the determination with every analysis, and report the combined oxides of iron and aluminum together as R_2O_3. It is the writer's opinion, however, that even if the iron content is fairly constant in most cements or clinkers, it is vitally important that it should be determined as frequently as the other elements. Of course in the case of limestones, clays or shales the iron content is quite variable and must be determined.

It is true that the methods now generally employed are fairly accurate, but it is agreed that they are rather tedious procedures and that a good portion of time is spent in the determinations if they are made at all frequently. The chemists of the "old school" have certain methods which they will stand by consistently, and will give precedence to no other method, come what may. It is not the purpose of this article to try to destroy their applicability, but simply to discuss some of these methods that are now prevalent in the cement-mill laboratories of this country, showing their disadvantages, and then to outline a procedure which, in the writer's opinion, is best applicable to the laboratory, because of its accuracy, simplicity and absence of the troublesome details which are common to the methods now in use. There are no startling revelations made herein, whereby the chemist can make the determination instantaneously, nor is there anything original; yet it is believed by the writer that many chemists are in the dark, so to speak, as to the procedure outlined herein, and would be gratifying recipients of such a publication.

An old standard method is the reduction of the iron solution with stannous chloride, neutralizing the excess with mercuric chloride and titrating with potassium dichromate, using potassium ferricyanide as an outside indicator. This involves the use of a "spot plate," which is rather bothersome, and the indicator must be made up fresh frequently, as potassium ferricyanide deteriorates rapidly in solution. Also many chemists experience difficulty in the observance of the endpoint of the reaction, as tested on the "spot plate," and it is agreed that this endpoint is rather obscure at times. This method is supported by many chemists and they adhere to it as the only reliable method, but in the writer's opinion it should be obsolete.

Still using the potassium dichromate as the titrating media, some chemists prefer to reduce the iron solution with the zinc reductor. This necessitates the maintenance of the reductor, which needs frequent "cleaning out," and the separation of the insoluble silica, which is present in the solution, by filtration. Also the purity of the zinc used must be known, as any iron present, which is often the case, will affect the results. Some chemists prefer to boil the zinc directly with the solution. In this case the purity of the zinc must also be known. And, of course, as long as the potassium dichromate is used for the titration, the troublesome outside indicator must be used.

Some chemists have undertaken the use of potassium permanganate as the titrating media, and in so doing have overcome the use of the outside indicator because potassium permanganate affords its own indicator. But in so doing they have replaced a stable standard with a variable one that needs frequent standardization. Also the endpoint of the potassium permanganate titration rapidly fades, in spite of the fact that a solution of phosphoric acid, sulphuric acid and manganous sulphate is added to prevent this (Zimmermann-Reinhardt solution). It will be well to note at this point that any of the methods of reducing the solution are applicable to this method and they all find their use in the various laboratories.

It has been the experience of many chemists that in the reduction of the iron solution with stannous chloride a black coloration appears which prevents the observance of the endpoint. This is caused by the fusion of insoluble samples in platinum crucibles. Traces of platinum are dissolved which, with the stannous chloride, forms a complex salt of the tin and the platinum. This is most often found when the stain left in the crucible after fusion is reclaimed by solution in hydrochloric acid and determined with the original solution.

Recommended Method

The following method of analysis has been used by the writer for a year in two different cement-mill laboratories and was found to be far more satisfactory than any of the methods herein previously described. It is based on the fact that diphenylamine can be successfully used as an inside indicator. In the presence of ferric salts potassium dichromate yields an intense blue and is rather sensitive to the presence of a slight excess of ferrous iron, which discharges the color. The method is described as follows:

Solution of the sample: Dissolve 1 gram of cement or clinker in 20 ccs. of water and 10 ccs. of concentrated hydrochloric acid. Use 1 gram of limestone or kiln-feed and 0.5 gram of shale or clay. Fuse with sodium carbonate, or any other suitable fusion mixture, and dissolve the melt in hydrochloric acid, keeping the solution as concentrated as possible.

Reduction of the iron solution: To the boiling solution add stannous chloride, drop by drop, until the yellow color of the ferric iron just disappears. Add a drop or two in excess, cover and set aside to cool to room temperature.

Titration of the solution: Dilute the solution to about 50 ccs. Add 20 ccs. of mercuric chloride solution, 20 ccs. of "titrating solution" and 5 or 6 drops of diphenylamine solution. Titrate with potassium dichromate solution. Near the endpoint the color of the solution changes from an emerald-green to a blue-green or grey-blue. At the completion of the titration an intense blue color flashes through the solution.

Stannous chloride solution: 20% solution in 1:3 hydrochloric acid. Keep in large dropping bottle with a few pieces of metallic tin to keep the solution reduced.

Mercuric chloride solution: Saturated solution.

Diphenylamine solution: 1% solution in concentrated sulphuric acid. Keep in dropping bottle of the eye-dropper type. In time the solution will darken, but this has deteriorating effects.

"Titrating solution": 150 ccs. each of phosphoric acid (syrupy) and concentrated sulphuric acid diluted to a liter with water.

Potassium dichromate solution: 3.075 grams of potassium dichromate per liter of water. This makes a solution with 1 cc. equivalent to 0.005 grams of Fe_2O_3.

To standardize the potassium dichromate solution, dissolve 0.4912 grams of ferrous ammonium sulphate in 50 ccs. of the "titrating solution," add the diphenylamine and titrate; 20 ccs. of the potassium dichromate solution should be required to produce the endpoint.

This method involves the use of potassium

dichromate as the titrating media which is a primary standard and once standardized it will retain the same factor indefinitely. The diphenylamine, as well as giving a vivid endpoint, also does away with the troublesome "spot plate" and the obscure endpoint of the potassium ferricyanide. All of the solutions used can be stocked in large quantities. In familiarizing one's self with the endpoint this method will prove superior to any other method the writer has ever used, and he has done considerable work on the subject.

In summarizing it can be stated that most of the methods used at present for the determination of iron oxide in cement and correlative materials have been discussed with their disadvantages emphasized. Finally a procedure is outlined in which none of the bothersome details, common to the other methods, are present, and which gives very satisfactory and accurate results.

It is the writer sincere hope that he may enlighten some chemist who is still struggling, so to speak, with some of the aforementioned methods and to convince him of the convenience of the method herein described.

References:

Mahin, Quantitative Analysis.
Scott, Standard Methods of Chemical Analysis.
Meade, Portland Cement.

Quick Test Method for Determining Sugar in Sand

N. H. ROY in a paper presented at the recent annual meeting of the American Society for Testing Materials outlined a quick bacteriological method for determining sugar in sand. The detrimental effects of sugar in concrete mortars are well known, hence it is important to be certain that none of it is introduced in the mix. Sugars are present in some material sands and are found to occur in some fields and streams—facts which may account for the poor concrete resulting from the unknowing use of such materials.

The proposed test is the reversal of a common bacterial test—the use of a common harmless bacterium, *Aerobacter aerogenes (Bacterium aerogenes)*, to test for the presence of sugar. A washing from the sand is placed in a test tube together with a small quantity of bouillon, the mixture is inoculated with *Aerobacter aerogenes* and set aside in a warm place for a short time. The presence of sugar is revealed by the liberation of carbon dioxide which is easily collected in a fermentation tube to furnish visual quantitative evidence. Carbon dioxide will not be liberated by the bacteria from organic materials such as tannic acid. The method is rapid and reliable and will detect very minute quantitites of sugar. Supporting data and photograph showing the results of tests are included.

Accurate Determination of Color Made Possible by New Instrument

THE EXACT duplication of any color at any time and at any place has been made possible by a new colorimeter developed by Prof. Arthur C. Hardy of the department of physics at Massachusetts Institute of Technology. For instance, should a new color be developed by fashion dictators at Paris, a photoradiogram of the color analysis can be sent to New York, and there duplicated by dye experts, even though these men will not be able to see an actual sample of the original color for some days.

The new color analyzer, known as a recording spectrophotometer, eliminates human judgment entirely, and automatically measures the color and wave lengths of any substance rapidly and with precision. Not only does it measure color accurately but it makes a record by which it is possible to match that shade at any time, thus eliminating all possibility of fading of a standard color.

The importance of the new color analyzer lies in its value to industry in nearly every branch of which control of the color of its products is necessary. Accurate measurement of colors is the first concern of manufacturers of fabrics, particularly in the delicate shades which often deceive the eye. Color control is also of basic importance in the making of inks, paints, dyes and paper. In fact, there is scarcely an industry without a color problem.

Canadian Testing and Research on Some Rock Products

THE DEPARTMENT of Mines, Canada, has recently released publication No. 615 containing reports of investigations made at the testing and research laboratories during 1927. Although the subjects covered are chiefly metallurgical, the reports on the nonmetallic work, particularly that on the removal of impurities from gypsum and silica sand are of interest.

Determination of Free Silica in Rocks and Clays

W. J. REES IN A RECENT issue of the *Quarry Managers Journal* (England) outlines simple methods by which the mineralogical composition of various siliceous rocks may be determined. To be sure, the calculations are not adequate where complex rocks are considered, but for the usual stone in the rock products industry they serve admirably.

So-called "rational analysis" methods, based on different solubility, do not give reliable results. A combination of ultimate chemical analysis with microscopic observation of the minerals present is by far a better procedure. Occasionally, methods based on density separations in liquids of known specific gravity may be used, but for most stones the combination method is the most satisfactory.

As an illustration of the procedure, Mr. Rees takes the following:

A clay of the following composition may be considered:

SiO_2	61.60%
Al_2O_3	24.92
Fe_2O_3	1.42
CaO	0.71
Na_2O	0.81
K_2O	1.56
H_2O	8.92
	99.94

The molecular proportions are:

SiO_2	$61.60 \div 60 = 1.026$
Al_2O_3	$24.92 \div 102 = 0.244$
Fe_2O_3	$1.42 \div 160 = 0.009$
CaO	$0.71 \div 56 = 0.013$
Na_2O	$0.81 \div 62 = 0.013$
K_2O	$1.56 \div 94 = 0.017$
H_2O	$8.92 \div 18 = 0.496$

Examination shows the clay to contain the minerals kaolinite (or clay substance), the formula of which is Al_2O_3, $2SiO_2$, $2H_2O$; quartz; limonite, the formula of which is Fe_2O_3, H_2O; lime feldspar (anorthite), the formula of which is CaO, Al_2O_3, $2SiO_2$; orthoclase and albite.

The calculation then proceeds:

$0.017 \times 556 = 9.45\%$ of orthoclase.
$0.013 \times 524 = 6.81\%$ of albite.
$0.013 \times 278 = 3.61\%$ of lime feldspar.
$0.009 \times 178 = 1.60\%$ of limonite.

In calculating the percentage of kaolinite the molecular quantities of alumina used in calculating the feldspars have to be allowed for. In orthoclase, albite and anorthite there is one molecule of Al_2O_3 to one molecule of K_2O, Na_2O and CaO respectively. The percentage of kaolinite is therefore:

$$[0.244 - (0.017 + 0.013 + 0.013)] \times 258 = (0.201 \times 258) = 51.86$$

The percentage of quartz is calculated, allowing for the silica used in calculating the feldspars and kaolinite. The calculation is:

$$1.026 - [(6 \times 0.017) + (6 \times 0.013) + (2 \times 0.013) + (2 \times 0.201)] = 0.418 \times 60 = 25.08$$

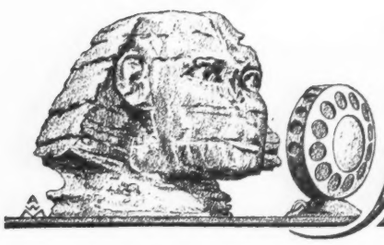
The calculated mineralogical composition of the clay is thus:

Kaolinite	51.86%
Quartz	25.08
Orthoclase	9.45
Albite	6.81
Anorthite	3.61
Limonite	1.60

It will be seen that this clay contains 61.60% of silica, but only 25.08% of "free silica."

Erratum

W. L. HOBBS, lime manufacturer, Dyserth, England, wants it understood the figures on the cost of lime manufacture at his plant, given in the series of articles, "Lime Burning Practice Based on European and American Observations," by Victor J. Azbe, in ROCK PRODUCTS, are not accurate so far as his operation is concerned, and their publication was not authorized by him.

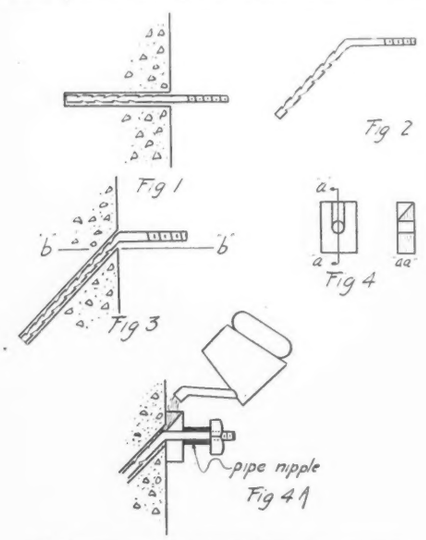


Hints and Helps for Superintendents

An Easy Method of Grouting in Bolts

By V. K. NEWCOMER
Missouri Portland Cement Co., St. Louis, Mo.

THE USUAL method used in grouting bolts in a vertical wall is to drill the hole horizontally, as shown in Fig. 1, which makes it almost impossible to get a first class job as the grout works out. If the



Diagrammatic procedure in secure grouting of bolts

bolt be bent at an angle as in Fig. 2 and the hole drilled in the wall to the same angle, the installation becomes as Fig. 3 when it is very easy to pour the grout into the hole. The grout will stay in of itself to the line BB and the balance can be plastered on. If a more workmanlike job than plaster is wanted, a piece of 2x6 can be cut as in Fig. 4, the hole to be a snug fit over the bolt, the grout around the bolt is allowed to set a little, the piece of 2x6 slipped over it with the pouring gate up, a pipe sleeve put over the bolt to act as a spreader and the nut pulled up tightly enough to hold the load. The grout is poured in as Fig. 4-A and after it has set a little the 2x6 can be removed and the face rubbed down.

Is This a Crushing Record?

OVER 1180 tons of limestone were recently put through the No. 7 1/2 Gates crusher in 10 hours at the Hagersville, Ont., plant of the Canada Crushed Stone Corp., Ltd. This, in the opinion of W. H. Lindsay, plant manager, constitutes a record performance and he is anxious to find out whether this has been exceeded by any other operator.

Mr. Quarry Superintendent, have you or do you know of anyone, who has bettered the above performance? If so, we will be glad to hear about it. Write and tell us!

—Editor.

Novel Conveyor Used to Reclaim Cement Clinker

By J. J. GRIERSON
Adelaide, Australia

THE author some time ago designed some portable conveyors which were originally intended for reclaiming cement clinkers. At a later date, the elevator attachment was built and fitted to one of the machines and has proved a very useful adjunct. It is used as the leading machine, and feeds on to a battery of conveyors arranged in series. The conveyor is a 14-in. rubber belt driven by motor and reduction gear at a speed of 200 f.p.m. The elevator attachment is driven by sprocket and chain from feed end of conveyor. The speed of the attachment is 150 f.p.m. It is equipped with 2-hp. motor, and has a capacity of 25 tons per hour. If pushed against a heap it loads itself rapidly, and has proved invaluable about the plant. The photograph shows the machine when first constructed and tried out on the coal heap.

Simply constructed reclaiming conveyor

Weld Repairing of a Ball Mill Fracture

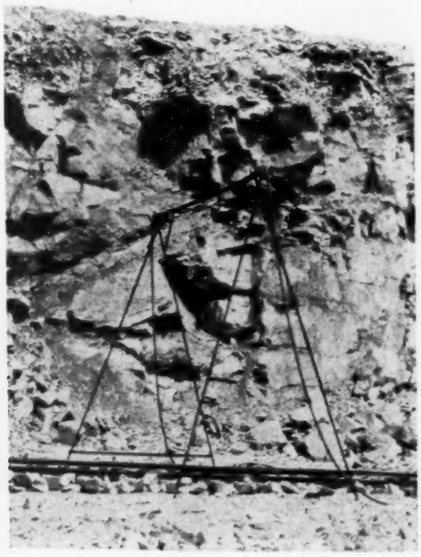
A SECTION of ball mill shell fractured along the edge of a flange joining two sections. This fracture was a little over 14 ft. long and the plant welder after viewing the break decided to obtain expert advice on the best procedure for handling the job from an oxy-acetylene service operator. The service operator advised bronze-welding with high strength rod, pointing out that no dismantling would be necessary and that preheating could be dispensed with. The first

Ball mill fracture repaired by welding

step of course was to thoroughly clean the metal in the vicinity of the crack and then vee along the break with an air chisel. The vee was then wire brushed clean, so that no particle of dirt or other foreign matter remained. After the preliminary coating or "tinning" coat of high strength bronze rod had been applied by the service operator the plant welder took his turn at bronze-welding. With the two men working on 30 minute shifts, welding proceeded at the rate of 2 ft. per hour—good welding time considering the fact that the shell was made of 1½-in. cast iron.

Electric Cable Bridges

MOST quarry operators think the proper way to get an electric shovel cable across a track is to pass it under the rails, but the operating staff at the Marble Cliff



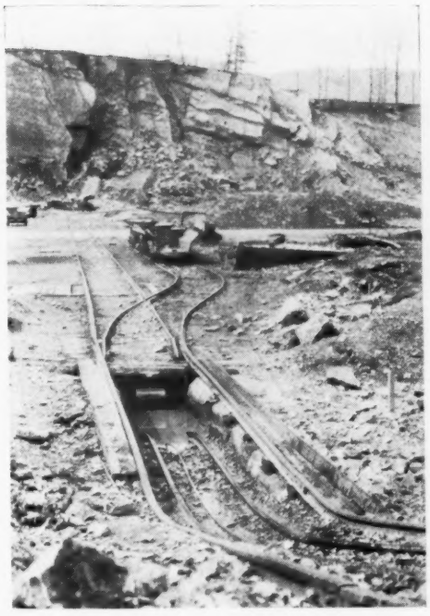
Lightweight electric cable bridge

Quarries Co., at Marble Cliff, Ohio, think otherwise, and we are somewhat inclined to agree with them after seeing the simple "bridge" they use for this purpose.

The so-called "bridge" is simply two "A"-shaped legs of light-weight pipe connected by a straight piece across the top and braced as shown in the illustration. Spool-shaped pullies at the apex of each "A" frame carry the cable and permit it to move freely longitudinally.

Smaller cable bridges are also used at convenient points along the cable to raise it off the quarry floor and lessen the wear and tear, which otherwise would be excessive where the electric lines continually drag over rough rocks.

The methods used by this company to protect its cables in the quarry were described in ROCK PRODUCTS, June 8, 1929.



The pit between the rails at the foot of the incline. Rock cars pass over the "dummy" car shown in the pit below

An Ingenious Hoisting Arrangement

AT the crushed limestone operation of the Tyrone Lime and Stone Co., Tyrone, Penn., one of the most novel devices that a ROCK PRODUCTS editor has had the opportunity of seeing is used in connection with the hoisting of the quarry cars up the incline to the primary crusher.

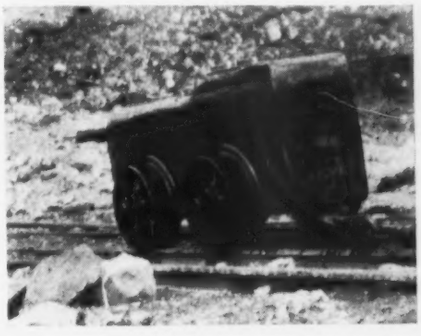
At the foot of the incline and between the rails has been dug a pit of sufficient size to allow a 24-in by 18-in. car, or "dummy" as it is called, to drop into. The rock cars can thus pass unhindered over this submerged dummy. The dummy rides a narow-gage track placed between the rails of the regular track and the hoisting cable is connected to it. When a stone car has been spotted at the foot of the incline, well ahead of the dummy car, the hoist operator pulls the dummy out of the pit and up the incline, thus pushing the quarry car to the top, where it is dumped on a tilting track. After the car has been dumped, slacking the pull line releases the dummy and the empty car follows it back to the foot of the incline.

The dummy is simply a metal-reinforced, hardwood block mounted on flanged wheels which ride the central tracks.

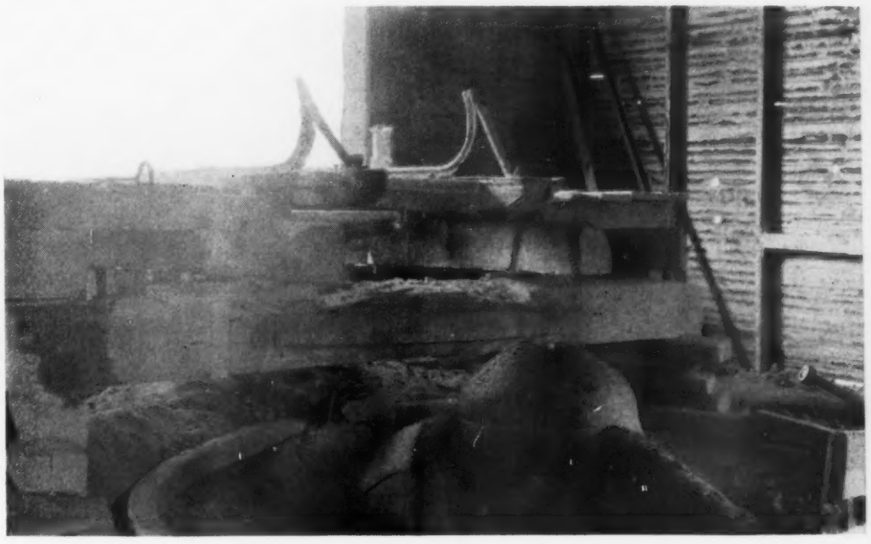
When Keyways Become Worn

WHEN PULLEYS work loose on shafts and it is found that the keyways are badly worn, considerable machine work may be avoided by using the following method which was developed by a machine shop in California:

The end of an oversize key is tipped with Stellite and then ground sharp. When this is driven into place the Stellited end does whatever cutting is necessary in order to seat the key securely.—*Oxy-Acetylene Tips.*



The "dummy" car, a reinforced, hardwood block mounted on flanged wheels



The tilting track at the primary crusher

National Safety Congress Programs

THE 18TH ANNUAL SAFETY CONGRESS is to be held in Chicago, September 30 to October 4, under the auspices of the National Safety Council. Of course, nearly everything on the program is interesting and valuable to those interested in industrial safety, but we will have to confine our notice and report of the congress to the sessions of the cement and quarry sections. It is hoped that by another year there will also be a sand and gravel section.

Cement Section

The cement section holds its first meeting at 9:30 a. m. at the Congress hotel (Gold room). The general chairman is F. E. Town, superintendent of the Manitowoc Portland Cement Co., Manitowoc, Wis. The vice-chairman is Edward H. Parry, safety director, Glens Falls Portland Cement Co., Glens Falls, N. Y.; the secretary, A. J. R. Curtis, assistant to the general manager of the Portland Cement Association, Chicago.

TUESDAY, OCTOBER 1

9:30 A.M. Annual report.
General Chairman Town.
9:45 A.M. Symposium on screw conveyor accidents.
M. L. Humphryes, mechanical engineer, Universal Portland Cement Co., Chicago.
10:45 A.M. Election of officers.
11:00 A.M. The surgeon's part in accident prevention—Dr. J. L. Rock, LaSalle, Ill.
11:30 A.M. Discussion. Led by Dr. C. E. Ogden, Universal Portland Cement Co., Chicago.

On Tuesday noon there will be a joint luncheon of the cement and quarry sections; and in the afternoon a joint session, a program for which will be found below under the program for the quarry section.

On Wednesday morning the cement section will resume its sessions with the following program:

WEDNESDAY, OCTOBER 2

9:30 A.M. First-aid training suggestions. J. J. Forbes, supervising engineer, U. S. Bureau of Mines, Pittsburgh, Penn.
10:00 A.M. Discussion.
10:30 A.M. Fatal and permanent disability Accidents in the cement industry—W. H. Weitknecht, superintendent, Lehigh Portland Cement Co., Mitchell, Ind.
11:00 A.M. Discussion.

On Wednesday afternoon there is an inspection trip to be described later.

Quarry Section

The quarry section holds its first meeting also at 9:30 Tuesday morning, October 1, at the Congress hotel (Rose room). R. E. Colville, manager, insurance department, United States Gypsum Co., Chicago, is general chairman; F. F. McLaughlin, superintendent of quarries, Rock-Cut Stone Co., Syracuse, N. Y., is vice-chairman; J. R. Boyd, secretary of the National Crushed Stone Association, Washington, D. C., is secretary.

TUESDAY, OCTOBER 1

9:30 A.M. Address of welcome and annual report.
General Chairman Colville.
9:45 A.M. Safety through the eyes—H. F. Yotter, insurance supervisor, General Crushed Stone Co., Easton, Penn.
10:15 A.M. Discussion.
10:25 A.M. Review of injuries in quarry and crushing operations—W. W. Adams, statistician, U. S. Bureau of Mines, Washington, D. C.
10:45 A.M. Discussion.
11:00 A.M. The executive's view of wastes—B. F. Welty, property manager, Pacific division, U. S. Gypsum Co., Chicago.
11:20 A.M. Discussion.

JOINT LUNCHEON

12:30 P.M. Address.
(Speaker to be announced later.)

JOINT SESSION—AFTERNOON

2:00 P.M. Safe practices in the quarry—T. Quigley, chief, quarry section, Department of Labor and Industry, Harrisburg, Penn.
2:30 P.M. Discussion.
2:50 P.M. (Speaker and subject to be announced later.)
3:20 P.M. Discussion.
3:40 P.M. Putting punch into a safety campaign—Jack Dempster, Canada Cement Co., Ltd., Port Colborne, Ont., Can.
4:10 P.M. Discussion.

WEDNESDAY, OCTOBER 2

9:30 A.M. Keeping abreast of the times—J. R. Boyd, secretary, National Crushed Stone Association, Washington, D. C.
10:00 A.M. Discussion.
10:10 A.M. Election of officers.
10:30 A.M. Competition as an aid in accident prevention. (Speaker to be announced later.)
11:00 A.M. Round table discussion:
Dust.
Hazards.
Rules.
Enforcement.

Inspection Trip

On Wednesday afternoon all members of the quarry, cement and mining sections are invited to visit the Dolese and Shepard quarry near Chicago. Demonstration of modern explosive and electrically controlled mechanical hauling system. Special busses will be provided.

Cement Mill Safety Meetings

THE PORTLAND CEMENT ASSOCIATION is holding a series of three regional safety meetings during September in states west of the Rockies. On Wednesday, September 18, a meeting of this kind will be held in Portland, Ore., for the cement mills of Oregon, Washington and British Columbia. On Tuesday, September 24, a similar meeting will be held for the California mills at Los Angeles, and on September 28 the Utah mills will assemble for a similar purpose at Ogden, Utah. The Portland meeting will be the first regional safety assembly held in the northern Pacific states and the Ogden meeting will be the first arranged for the mills at Salt Lake City, Brigham City and Devil's Slide, Utah.

On the day following the Portland meeting the Oregon Portland Cement Co. will dedicate its Portland Cement Association safety trophy at Oswego, a suburb of Portland, where its mill is located. Civic and business leaders of Portland and vicinity will attend as well as the officials of several other cement companies located in the Pacific northwest.

The annual meeting of the cement section, National Safety Council, will be held at the Congress hotel, Chicago, on Tuesday and Wednesday, October 1 and 2, as a part of the National Safety Congress convening in Chicago, September 30 to October 4. A joint luncheon will be held with the quarry section on October 1, with J. B. John, chairman of the committee on accident prevention of the Portland Cement Association, acting as chairman. Walter A. Wecker, secretary and treasurer of the Marquette Cement Manufacturing Co., and Charles A. Irvin, vice-president of the Alpha Portland Cement Co., will be the speakers.

Notation "Penn-Allen" Held Registrable as Trade-Mark

THE NOTATION "Penn-Allen" was held to be registrable as a trade mark for portland cement as being arbitrary, fanciful and novel, and functioning as a trade mark when applied to appellant's merchandise.

The holding of the examiner of trade marks to the effect that the words were merely the surnames of individuals, and as such not registrable, was reversed by the assistant commissioner.—*U. S. Daily.*

Rhodesian Cement Mill

ACCORDING to *The Engineer* (London), the Northern Rhodesia Lime and Cement Co., Ltd., has been formed with a capital of £200,000 for the manufacture of portland cement and the preparation and sale of various grades of lime at the Chipongwe Estate. Chipongwe is situated about 350 miles north of Wankie, on the main line of railway to the Congo, and is 106 miles by rail south of Broken Hill and 235 miles from the Congo border. The estate contains large deposits of a blue banded limestone containing an average of 95% of calcium carbonate, together with shales and clays, all suitable for making a high grade of portland cement. A later report states that a cement plant capable of producing 10,000 bbl. of cement per month is to be erected at Chipongwe.

Editorial Comment

Pardon Our Moralizing!

During the past few years we have all heard much of "co-operation" in industry—a tremendously overworked word. Generally it refers to co-operation between competitors within an industry. But in a sense every man is a competitor of every other man for sustenance and for the good things of life. Every man in an organization, in his own imagination at least, is a competitor of every other for the top rounds of the ladder. No one wishes to change this state of affairs because this freedom to grow and to achieve is ingrained in every normal American, and there is no limit in our laws or institutions, written or unwritten, designed to curb a man's legitimate ambitions or his initiative or his opportunities.

But every one who has been a part of a large organization knows that unbridled competition between the members of such an organization for place, favor or control can work havoc to the well-being of that organization just as much as unbridled competition among competitors in an industry may ruin that industry. Consequently all successful business executives give and must give a large part of their thought and energies to the promotion of a spirit of co-operation and teamwork within their own organizations.

"Example is better than precept." So an example of unselfishness in a business executive is far more likely to produce results than carefully and elaborately worked out and much heralded plans for employes' welfare. The most fundamental thing the successful executive learns is that one must give before he can receive. Of course, that is one of the fundamental concepts of Christianity, and one of the maxims of all the wise men of the world prior to Christianity. And whether or not he knows he is practicing part of the code of Christianity, every man of intelligence comes sooner or later to experience the truth of that maxim—"give if you would receive." The one who always fears he will give more than he receives payment for never will receive very much in any capacity, or in any form, financial or otherwise. Probably there are other parts of a Christian or moral code that could be proved in business practice with equal clearness, but we are still only half-heartedly experimenting with them.

Some men spend a life-time accumulating a fortune, usually only to learn just before they die, that the only genuine satisfaction in living is the knowledge that they have helped some one else to get a little joy out of life. Happy then is the business organization, such as that described elsewhere in this issue, which finds out and practices some of these fundamentals without conscious assistance from the top.

Properties of Aggregates

The papers and discussions of the recent meeting of the American Society for Testing Materials on the subject of concrete aggregates were a little disappointing to those who had hoped for something new and important regarding the *properties* of aggregates. The word properties is used here to include those attributes which come from the material of which the aggregate is made, such as minerological composition, hardness, shape, surface texture, and so on, and not those which may be given by screening or washing, which are commonly spoken of as characteristics. It is true that research in the properties of aggregates is so new that not much could be expected at present, but it is known that much of it is going on and it was hoped that some of this was sufficiently advanced so that more of the findings than those given in the papers might be published.

Regarding the characteristics of aggregates—size, gradation, percentage of voids, and so on—we now have a good sized volume of literature showing their effects on concrete design. This work has been of incalculable value; it is not too much to say that the whole of modern concrete making rests on it. But while the study that produced it was going on, the study of the properties of aggregates was neglected. Their effect is small as compared with that of the water-cement ratio, for example, on compressive strength, and compressive strength was all that was thought of in most of the earlier investigations. But the study of highway concrete and the importance of knowing all the factors that entered into flexural strength has shown the importance of properties and put the whole subject of aggregates in a new light.

During the study of their characteristics, some knowledge of the properties of aggregates has been acquired. A search through the many series of tests that have been made in the study of the water-cement ratio or the mortar voids theory, reveal abundant evidence of their effects and sometimes an acknowledgement of it. It is generally known that smooth rounded grains give the same slump with a lower water-cement ratio than angular grains, and that the use of more sand with angular grains gives greater workability and permits a lower cement factor, other things being equal. The absorbent effect of certain aggregates in reducing the net water-cement ratio, hence giving a higher than calculated strength, has also been noted. As to durability, it is pretty generally recognized that the life of concrete depends on the properties of the aggregate of which it is made, where mixing, placing and curing are not involved.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

Stock	Date	Bid	Asked	Dividend
Allentown P. C. 1st 6's[29]	9-10-29	91	93	
Alpha P. C. new com.	9- 9-29	44	46	75c qu. July 15
Alpha P. C. pfd.	9- 9-29	116	.....	1.75 Sept. 14
American Aggregates com.[29]	9-10-29	.....	47	75c qu. Mar. 1
Amer. Aggregate 6's, bonds	8-26-29	95	.....	
American Brick Co., sand-lime brick	9- 9-29	14	16	25c qu. Feb. 1
American Brick Co. pfd., sand-lime brick	9- 9-29	.....	75	50c qu. Aug. 1
Am. L. & S. 1st 7's[26]	9-10-29	96	97½	
American Silica Corp. 6½'s[49]	9-11-29	95	100	
Arundel Corp. new com.	9-10-29	44¾	45	50c qu. July 1
Atlantic Gyp. Prod. (1st 6's & 10 sh. com.)[10]	9-11-29	80	90	
Atlas P. C. com.	9- 9-29	47	49	50c qu. Sept. 3
Beaver P. C. 1st 7's[30]	8-23-29	98	101	
Bessemer L. & C. Class A	9- 9-29	33¾	35	75c qu. Aug. 1
Bessemer L. & C. 1st 6½'s[4]	8-26-29	93	96	
Bloomington Limestone 6's[29]	9-10-29	88	90	
Boston S. & G. new com.	9- 6-29	23	24	40c qu. July 1
Boston S. & G. new 7% pfd.	9- 6-29	52½	.....	87½c qu. July 1
Calaveras Cement 7% pfd.	9- 7-29	88¼	89	
Calaveras Cement com.	9- 7-29	19½	20	
Canada Cement com.	9- 9-29	26⅛	27½	
Canada Cement pfd.	9- 9-29	97½	99	1.62½ qu. Sept. 30
Canada Cement 5½'s[11]	9- 7-29	98	100	
Canada Cr. St. Corp. 1st 6½'s[32]	9- 6-29	98	100	
Canada Gyp. & Alabastine	9- 9-29	.....	127½	75c qu. July 2
Can. Gyp. & Alabastine (new)	9- 9-29	31	31½	
Certainteed Prod. com.	9-10-29	29	29¼	
Certainteed Prod. pfd.	9-10-29	73	75	1.75 qu. Jan. 1
Cleveland Quarries new st'k	9- 9-29	65	69½	50c&25c ex. Sept.1
Columbia S. & G. pfd.	9- 9-29	87½	91	
Consol. Cement 1st 6½'s, A[42]	9-11-29	90	95	
Consol. Cement 6½% notes[24]	9-11-29	85	90	
Consol. Cement pfd.[29]	9-10-29	50	60	
Consol. Oka S. & G. 6½'s[12] (Canada)	9- 4-29	100½	102	
Consol. Rock Prod. com.[44]	9- 5-29	5½	7½	
Consol. Rock Prod. pfd.[20]	8-23-29	.....	23	
Consol. Rock Prods. units[20]	7-27-29	52	53	
Consol. S. & G. com. (Can.)[43]	9- 6-29	No market		
Consol. S. & G. pfd. (Can.)	9- 9-29	91½	93	1.75 qu. Aug. 15
Construction Mat. com.	9-10-29	23¾	24½	
Construction Mat. pfd.	9-10-29	44½	45	87½c qu. Aug. 1
Consumers Rock & Gravel, 1st Mtg. 6's, 1948[15]	9- 7-29	95	98½	
Coosa P. C. 1st 6's[29]	9-10-29	50	55	
Coplay Cem. Mfg. 1st 6's[40]	9- 9-29	90	.....	
Coplay Cem. Mfg. com.[40]	9- 9-29	10	.....	
Coplay Cem. Mfg. pfd.[40]	9- 9-29	70	.....	
Dewey P. C. 6's[30]†(1930-41)	9-11-29	96	.....	
Dewey P. C. 6's[30] (1942)	9-11-29	100	.....	
Dolese & Shepard	9-10-29	110	115	$2 qu. July 1
Edison P. C. com.[39]	9- 7-29	10c	.....	
Edison P. C. pfd.[39]	9- 7-29	25c	.....	
Giant P. C. com.[25]	9-10-29	26	36	
Giant P. C. pfd.[25]	9-10-29	30	38	3½% s.-a. June 15
Ideal Cement, new com.	9- 7-29	65	70	75c qu. July 1
Ideal Cement 5's, 1943[33]	9- 7-29	97	100	
Indiana Limestone units[29] (5 shs. com. & 1 sh. pfd.)	9-10-29	No market		
Indiana Limestone 6's	9-10-29	77	.....	
International Cem. com.	9-10-29	69	69½	$1 qu. Sept. 27
International Cem. bonds 5's	9- 9-29	100¼	101½	Semi-ann. int.
Iron City S. & G. bonds 6's[48]	9- 6-29	87	92	
Kelley Is. L. & T. new st'k	9- 9-29	51	55	62½c qu. July 1
Ky. Cons. St. com. Voting Trust Certif.[48]	9- 7-29	13	14	
Ky. Cons. Stone 6½'s*[48]	9- 7-29	96	100	
Ky. Cons. Stone pfd.[48]	9- 7-29	90	95	
Ky. Cons. Stone com.[48]	9- 7-29	13	14	
Lawrence P. C.	9- 9-29	50	75	2% qu. June 29
Lawrence P. C. 5½'s, 1942	9- 6-29	85	90	
Lehigh P. C.	9-10-29	43½	44½	62½c qu. Aug. 1
Lehigh P. C. pfd.	9-10-29	108½	109	1¾% qu. Oct. 1
Louisville Cement	8-12-29	250	.....	
Lyman-Richey 1st 6's, 1932[13]	9- 9-29	95	98	
Lyman-Richey 1st 6's, 1935[13]	9- 9-29	94	97	
Marblehead Lime 6's[14]	9-10-29	98	100	
Material Service Corp.	9- 9-29	31⅛	.....	50c qu. Sept. 1
Medusa Portland Cem.[29]	9-10-29	120	125	1.50 Oct. 1
Mich. L. & C. com.[6]	9- 7-29	35	.....	
Missouri P. C.	9-10-29	39½	40	50c qu. Aug. 1
Monolith Midwest[9]	9- 5-29	8½	10	
Monolith bonds, 6's[9]	9- 5-29	97	98	
Monolith P. C. com.[9]	9- 5-29	14	14½	40c s.-a. July 1
Monolith P. C. pfd.[9]	9- 5-29	9	9½	40c s.-a. July 1
Monolith P. C. units[9]	9- 5-29	32	33½	
National Cem. (Can.) 1st 7's[29]	9-10-29	97	100	
National Gypsum A com.	9-10-29	13	14	
National Gypsum pfd.	9-10-29	55	58	
Nazareth Cem. com.[26]	9- 6-29	26	29	
Nazareth Cem. pfd.[26]	9- 6-29	100	105	
Newaygo P. C. 1st 6½'s[29]	9-10-29	102	103	
New Eng. Lime 1st 6's[14]	9-10-29	96	98	
N. Y. Trap Rock 1st 6's	9- 7-29	96¼	.....	
North Amer. Cem. 1st 6½'s	9-10-29	67½	.....	
North Amer. Cem. com.[29]	9-10-29	.....	7	
North Amer. Cem. 7% pfd.[29]	9-10-29	26	32	1.75 qu. Aug. 1
North Amer. Cem. units[29]	9-10-29	.....	36	
North Shore Mat. 1st 5's[15]	9-11-29	96	.....	
Northwestern States P. C.[37]	7-26-29	140	.....	
Ohio River Sand com.	9-10-29	28½	30	
Ohio River Sand 7% pfd.	9-10-29	100	102	
Ohio River S. & G. 6's[16]	9- 7-29	93	95	
Pac. Coast Agg. 6½'s	8-29-29	99	.....	
Pac. Coast Agg. 7's	8-29-29	99	.....	
Pac. Coast Cem. 6's, A[5]	9- 6-29	.....	95	
Pacific Lime Co. pfd.[42]	9- 6-29	No market		
Pacific P. C. com.	9- 7-29	25	29½	
Pacific P. C. pfd.	9- 7-29	80	84	1.62½ qu. July 5
Pacific P. C. 6's[5]	9- 6-29	94½	100	
Peerless Egyp'n P. C. com.[21]	9- 7-29	2¼	3½	
Peerless Egyp'n P. C. pfd.[21]	9- 7-29	82	88	1.75 July 1
Penn-Dixie Cem. 1st 6's	9-10-29	77¾	.....	
Penn-Dixie Cem. pfd.	9-10-29	45	49¾	1.75 qu. Sept. 15
Penn-Dixie Cem. com.	9-10-29	9⅝	10	
Penn. Glass Sand Corp. 6's	9- 6-29	101	103	
Penn. Glass Sand pfd.	9- 6-29	113	115	
Petoskey P. C.	9-10-29	9½	10½	1½% qu.
Riverside P. C. com.[5]	9- 6-29	22	.....	
Riverside P. C. pfd.[9]	9- 5-29	96	.....	1.50 qu. Aug. 1
Riverside P. C., A[9]	9- 5-29	16	18	31¼c qu. Aug.1
Riverside P. C., B[9]	9- 5-29	5	.....	
Santa Cruz P.C. 1st 6's, 1945	9- 7-29	108½	.....	6% annual
Santa Cruz P. C. com.	9- 7-29	95	.....	$1 qu. July 1
Schumacher Wallboard com.	9- 7-29	.....	16	
Schumacher Wallboard pfd.	9- 7-29	23½	25	50c qu. Aug. 15
Southwestern P. C. units[44]	9- 5-29	275	.....	
Standard Paving & Mat. (Can.) com.	9- 9-29	34	34¼	50c qu. Aug. 15
Standard Pav. & Mat. pfd.	9- 9-29	.....	96	1.75 qu. Aug. 15
Superior P. C., A	9- 7-29	43	44	27½c mo. Sept. 1
Superior P. C., B	9- 7-29	23	.....	
Trinity P. C. units[37]	7-26-29	142	150	
Trinity P. C. com.[37]	7-26-29	51	.....	
Trinity P. C. pfd.[29]	9-10-29	108	115	
U. S. Gypsum com.	9-10-29	86¼	86½	2% qu. Sept. 30
U. S. Gypsum pt. paid	9-10-29	80	82	
U. S. Gypsum pfd.[29]	9-10-29	124	127	1¾% qu. Sept. 30
Universal G. & L. com.[3]	9-11-29	50c	1½	
Universal G. & L. pfd.[3]	9-11-29	8	12	
Universal G. & L., V.T.C.[3]	9-11-29	No market		
Universal G. & L. 1st 6's[3]	9-11-29	60	.....	
Warner Co. com.[16]	9- 7-29	51	53	50c qu. July 15
Warner Co. 1st 7% pfd.[16]	9- 7-29	100	103	1¾% qu. July 1
Warner Co. 1st 6's[8]	9-11-29	99	99½	
Whitehall Cem. Mfg. com.[36]	9- 7-29	125	.....	
Whitehall Cem. Mfg. pfd.[36]	9- 7-29	98	.....	
Wisconsin L. & C. 1st 6's[15]	9-11-29	97	.....	
Wolverine P. C. com.	9- 9-29	.....	5	15c qu. Aug. 15
Yosemite P. C., A com.[9]	9- 5-29	5	6	

*Ann. interest due May and Nov. 1. Semi-ann. coupon of $32.50 paid Nov. 1. †Called for redemption at 102, Sept. 1.
[1]Quotations by Watling Lerchen & Hayes Co., Detroit, Mich. [2]Quotations by Bristol & Willett, New York. [3]Quotations by Rogers, Tracy Co., Chicago. [4]Quotations by Butler Beadling & Co., Youngstown, Ohio. [5]Quotations by Freeman, Smith & Camp Co., San Francisco, Calif. [6]Quotations by Frederic H. Hatch & Co., New York. [7]Quotations by F. M. Zeiler & Co., Chicago, Ill. [8]Quotations by Dillon, Read & Co., Chicago, Ill. [9]Quotations by A. E. White Co., San Francisco, Calif. [10]Quotations by Lee Higginson & Co., Boston and Chicago. [11]Nesbit, Thomson & Co., Montreal, Canada. [12]James Richardson & Sons, Ltd., Winnipeg, Man. [13]Peters Trust Co., Omaha, Neb. [14]First Wisconsin Co., Milwaukee, Wis. [15]Central Trust Co., of Illinois, Chicago. [16]J. S. Wilson, Jr., Co., Baltimore, Md. [17]Chas. W. Scranton & Co., New Haven, Conn. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hoit, Rose & Troster, New York. [20]Quotations by Bond & Goodwin & Tucker, Inc., San Francisco. [21]Baker, Simonds & Co., Inc., Detroit. [22]Hemphill, Noyes & Co., New York City, N. Y. [23]Blair & Co., New York and Chicago. [24]A. B. Leach & Co., Inc., Chicago. [25]Richards & Co., Philadelphia, Penn. [26]Hincks Bros. & Co., Bridgeport, Conn. [27]J. G. White & Co., New York. [28]Mitchell-Hutchins Co., Chicago, Ill. [29]National City Co., Chicago, Ill. [30]Chicago Trust Co., Chicago. [31]McIntyre & Co., New York, N. Y. [32]A. E. Ames & Co., Toronto, Can. [33]Boettcher Newton & Co., Denver, Colo. [34]Kidder, Peabody & Co., Boston, Mass. [35]Farnum, Winter & Co., Chicago. [36]Hanson and Hanson, New York. [37]S. F. Holzinger & Co., Milwaukee, Wis. [38]McFetrick & Co., Montreal Que. [39]Tobey and Kirk, New York. [40]Steiner, Rouse and Stroock, New York. [41]Hornblower & Weeks. New York City and Chicago. [42]E. H. Rollins, Chicago, Ill. [43]Jones, Heward & Co., Montreal, Que. [44]Tenney, Williams & Co., Inc., Los Angeles, Calif. [45]Taylor Ewart & Co. [46]Stein Bros. & Boyce, Baltimore, Md. [47]Bank of Pittsburgh. Pittsburgh, Pa. [48]E. W. Hays & Co., Louisville, Ky. [49]Blythe Witter & Co.

INACTIVE ROCK PRODUCTS SECURITIES (Latest Available Quotations)

Stock	Price bid	Price asked
American Brick Co. pfd., 13 sh.[6] (par 25)	24	.....
Atlantic Gypsum Products[6] com., 200 shares	$2 per share	.....
International Portland Cement Co., Ltd., pfd.	30	45
Rockland & Rockport Lime Co. 2nd pfd.[7] 13½ sh.	2⅞ per share	.....
Rockland & Rockport Lime Co. com.[7] 14½ sh.	55c per share	.....
Seaboard P. C.[1] 6% bonds ($7,500) 7-1-27. July, 1910, and subsequent coupons attached	$10 for the lot	.....
Southern Phosphate Co.[6]	1¼	.....
Universal Gypsum com. free stk.[1] 300 shares	$75 for the lot	.....
Universal Gypsum com.[1] 153 shares (no par)	$51 for the lot	.....
Vermont Milling Products Co. (slate granules), 22 sh. com. and 12 sh. pfd.[6]	$1 for the lot	.....
Winchester Rock Brick Co., pfd., 1 share (par $25) and 1 share com. (par $10)[6]	$8 for the lot	...

[1]Price obtained at auction by Adrian H. Muller & Sons, New York. [6]Price obtained at auction by Wise and Arnold, Boston, Mass., June 19, 1929. [7]Price obtained at auction by R. L. Day & Co., August 21, 1929.

Warner Company Earnings

THE WARNER CO., Philadelphia, Penn., which was organized last April as a consolidation of the Charles Warner Co. and the Van Sciver Corp., showed a net balance available for the common stock from the first quarter's operations of $397,791, which is equivalent to $1.96 per share on the 203,000 shares of common stock outstanding. This balance is after all expenses and charges, including Federal income tax as well as liberal deductions for depreciation and depletion charges.

Business, it is stated, has been running well in August and with September bookings, it is expected that the balance available for the common stock for the second quarter will be upward of $2 per share, making approximately $4 earned on common for the first six months.

The company paid an initial quarterly dividend of 50 cents per share on the common stock on July 15, putting the shares on a $2 annual basis. Common shares were recently admitted to trading on the unlisted department of the Philadelphia Stock Exchange.

The company for July reports gross sales of $1,301,133. After providing for monthly proportion of bond and other interest, depreciation, depletion, federal taxes and dividends on first and second preferred stocks, the balance of $160,717 was equal to 79c. a share on the 203,000 shares of no par value common stock outstanding. For four months ended July 31 balance available for common stock was $558,508, equal to $2.75 a share.

Calaveras Cement Listed on San Francisco Exchange

THE SAN FRANCISCO Stock Exchange has authorized the listing of 22,779 shares preferred stock, par $100, and 125,558 shares common stock of no par value of the Calaveras Cement Co.

The preferred and common stock were issued for the acquisition of property, to provide funds for the construction of a cement plant and for working capital. All outstanding stock was sold for cash except 2250 shares preferred stock and 72,500 shares common stock which were issued in exchange for property. The total amount spent on land and mineral rights from the date of incorporation (January 13, 1925) to March 31, 1929, was $327,354.

The company owns approximately 3000 acres in the vicinity of San Andreas, Mokelumme Hill and Old Gulch, Calaveras county, California. It owns 1315 acres in fee and holds 1400 acres under option to be acquired in fee upon final payment in October, 1930. The property of the company also includes about 285 acres in mineral rights and easements.

The board of directors consists of William Wallace Mein (president), Stuart L. Rawlingc (vice-president), G. B. Poore (vice-president), W. L. Honnold, H. C. Mudd, R. C. Warriner, Frank L. Taylor, S. Waldo Coleman, E. L. Wilhoit, Arthur B. Shelby, Lloyd Baldwin and R. F. M. Duncan. Harry Probert is comptroller and treasurer; William Schnaufer, Jr., secretary, and J. B. Smith, assistant secretary and assistant treasurer.

Ideal Cement Prospects

IDEAL CEMENT CO. is enjoying a prosperity that points to increased dividends. On September 1 the company opened a new $2,500,000 plant in Howard county, Arkansas and plans have been completed for the immediate doubling of its capacity, giving it a total output of 4500 bbl. of cement a day.

The plant will supply virtually the entire requirements for the million dollar road building program scheduled by Arkansas for the current year. The company also has a $400,000 contract to supply Louisiana for a road construction project. Its plants in Oklahoma, Colorado, Utah, Nebraska and Montana are also booked to capacity.

In the near future nearly every mill in the Ideal system will be using natural gas for fuel, materially reducing operating costs. —*Wall Street Journal.*

Called for Redemption

THE entire issue of Banner Rock Products Co.'s 1st 6s '35 has been called for redemption at 103, September 1. This company was recently absorbed by Johns-Manville, Inc., New York City.

CALAVERAS CEMENT CO. EARNINGS, 1926-1929

	Earnings for			
	3 months ended Mar. 31, 1929	Year ended Dec. 31, 1928	Year ended Dec. 31, 1927	3 mos. ended Dec. 31, 1926
Net sales	$607,254	$2,017,253	$1,158,221	$324,223
Cost of sales	312,278	1,082,957	806,214	257,253
Selling and general expenses	48,374	197,416	178,168	86,928
Balance, profit	$246,602	$736,880	$173,838	*$19,958
Other income	4,734	16,491	4,667	598
Total profit	$251,336	$753,371	$178,506	*$19,360
Interest on loans	7,000	28,000	31,561	18,993
Provisions for federal income taxes	29,574	89,010	10,968	.....
Organization expenses written off	.....	.....	14,967	8,750
Sales expenses prior to June 1, 1926	.....	.....	21,507	8,500
Net profit	$214,762	$636,361	$99,502	*$55,604

*Deficit.

Monolith Portland Report

MONOLITH PORTLAND CEMENT CO., Los Angeles, Calif., reports for the quarter ended March 31, 1929, net income of $136,685 after deduction of all charges. Net sales amounted to $766,108.

The company reports net profits for the six months ended June 30, 1929, after all charges, including interest and federal income tax, of $307,732, equal after preferred dividend requirements to $1.10 per share on the 225,000 shares of common stock outstanding, or at the annual rate of $2.20 per share on the common stock. Net sales totaled $1,535,000.

The corporation reports total current assets of $1,771,000, against total current liabilities of $449,000, a ratio of 4 to 1.

U. S. Gypsum 6-Month Earnings 1929, 1928 and 1927 Compared

THE EARNINGS for the first half (six months ending June 30) for the years 1929, 1928, 1927 of the United States Gypsum Co. were as follows:

	Six months ended June 30		
	1929	1928	1927
Total earnings	$3,258,663	$4,389,577	$5,023,556
Federal taxes	263,056	437,004	590,311
Depletion and depreciation	666,363	618,086	540,943
Net profit	$2,329,244	$3,334,487	$3,892,302
Shares common outstanding, par $20	765,027	691,502	688,273
Earnings per share	$2.70	$4.42	$5.24

Republic Portland Cement Financing

C. P. MANN & CO., the Guardian Trust Co., Neuhaus & Co., Dillinghom & McClung, the Dallas Union Trust Co., the Frost-Whited Investment Co., and the Link-Ford Co. are offering at 100 and dividend, $1,000,000, 7% cumulative preferred stock (with warrants) of the Republic Portland Cement Co., San Antonio, Tex.

Dividends are payable quarterly, beginning in March, except that the first dividend shall be for six months payable March 1, 1930. Dividends are exempt from normal Federal income tax and this stock is not subject to any property tax in Texas.

The stock is redeemable at the option of the company, as a whole or in part, on any dividend date on 30 days' notice at $105 per share and dividend up to and including September 1, 1934, and at $103 per share and dividend thereafter. In the event of voluntary liquidation of assets each outstanding share of this stock shall be preferred as to any accrued dividends thereon and as to assets to the extent of the par value thereof. The transfer agents are Alamo National Co., San Antonio; registrars, Alamo National Bank, San Antonio.

Warrants.—Each share of preferred stock will carry a detachable warrant entitling the holder thereof to purchase four shares of common stock at $5 per share if exercised

during 1929, at $7.50 per share if exercised during 1930, at $10 per share if exercised during 1931. Warrant privileges expire December 31, 1931.

Sinking Fund.—The company has created a sinking fund for the preferred stock equivalent to 2½c. per barrel cement sold payable out of net earnings to retire preferred stock by purchase in the open market or by redemption at the call price whichever may be lower. The fund will commence on January 1, 1931, and will operate semi-annually on January 1 and July 1.

An additional sinking fund has also been created to commence March 1, 1931, providing that 25% of all net earnings amounting to more than $2.50 per share per annum on the common stock shall be set aside to retire preferred stock in the same manner on March 1 of the year immediately following that in which any additional sinking fund may be available.

Data from Letter of J. H. Smith, President of the Company

Company.—Has been organized in Texas to engage in the manufacture and sale of portland cement. The company owns 475 acres of land lying approximately 10 miles north of San Antonio and served by the Missouri Pacific and the Missouri-Kansas-Texas railroads. Richard K. Meade & Co., of Baltimore, a nationally recognized cement authority, and Terrell Bartlett Engineers, Inc., San Antonio, have reported that this tract of land contains excellent cement making materials sufficient to supply the present annual manufacturing capacity for over 100 years. Upon this land the company has completed a modern portland cement plant of 1,250,000 bbl. annual capacity, equipped with the latest types of cement making machinery and arranged with appurtenances for outstanding economy of operation.

The company will co-operate with the Portland Cement Association, and will sell Longhorn brand cement at same price levels as maintained by other portland cement companies.

The land, buildings and equipment, together with housing developments for employes, have a value of not less than $3,500,000.

Earnings.—Company estimates that its net earnings, for the first full year of operation, after operating expenses, local taxes, depreciation and interest on the $1,500,000 first mortgage 6% bonds to be outstanding, will be in excess of $520,000, or nearly 7½ times the dividend requirements on this issue of $1,000,000 preferred stock.

Capitalization.—

	Authorized	Issued
First mortgage 6% sinking fund gold bonds, due 1943	$1,500,000	$1,500,000
7% cumulative preferred stock (par $100)	*1,250,000	1,000,000

*Additional preferred stock reserved for permanent additions or improvements or additional working capital or extension of holdings or retirement of bonds. †50,000 shares reserved for the exercise of stock purchase warrants.

Purpose —This $1,000,000 preferred stock, together with the $1,500,000 first mortgage 6% bonds, have been issued to Smith Brothers, Inc., by the company in full payment of money advanced by Smith Brothers, Inc., which, with money advanced for 200,000 shares of common stock, have provided for the acquisition of land and completed construction of the buildings and equipment, free and clear of all debt and incumbrances, except the first mortgage bonds referred to.

Penn.-Dixie Cement Balance Sheet—June 30

THE balance sheet of the Pennsylvania-Dixie Cement Corp., as of June 30, is reported as follows:

ASSETS

	1929	1928
Cash	$1,402,878	$965,791
Pyramid Portland Cement Co.	‡	1,305,507
Notes and accounts receivable	1,374,257	1,879,046
Inventories	3,432,435	2,951,486
Fixed assets	*25,735,348	25,311,576
Miscellaneous investments	84,100	118,600
Insurance fund	35,000	35,000
Deferred charges	106,926	93,855
Total	$32,170,944	$32,660,861

LIABILITIES

	1929	1928
Accounts payable	$152,515	$676,816
Accrued wages, interest, taxes, etc.	380,300	429,974
Reserve for federal taxes	206,377	261,177
Miscellaneous reserves	197,564	42,022
First mortgage sinking fund 6's	11,792,000	11,941,960
7% cumulative preferred stock	13,588,800	13,588,800
Common stock of no par value	†4,000,000	4,000,000
Surplus	1,853,388	1,720,112
Total	$32,170,944	$32,660,861

*After deducting depreciation. †Represented by 400,000 shares of no par value. ‡Entire capital stock and properties.

Standard Paving and Materials, Ltd. Preferred Stock

STEWART, LEULLY & CO., Ltd., and Harley, Milner & Co., Toronto, Ont., have recently sold $1,500,000 of 7% cumulative, convertible, redeemable preference shares of the Standard Paving and Materials, Ltd., Toronto, at 100.

These preference shares are fully paid and non-assessable, entitling the holder to preferential cumulative cash dividends at the rate of 7% per annum payable quarterly beginning in February, at any branch of the companies' bankers in Canada (first dividend paid May 15, 1929). Preferred as to assets over other class shares, and to the extent of 110 and dividends in case of voluntary liquidation. Redeemable all or part by purchase in the open market at the lowest available price not exceeding the redemption price, or on any dividend date upon 30 days' notice at $110 per share and dividends. Convertible into common shares at any time on the basis of 2½ common shares without par value for each one preference share unless previously called for redemption. In the event of preference shares being called the conversion privilege may be exercised at any time up to 10 days' prior ot date fixed for redemption.

Capitalization.—

	Authorized	Issued
7% cumulative convertible redeemable preferred shares (par $100)	$1,500,000	$1,500,000
Common stock (no par value), shares	*200,000	104,872

*37,500 common shares reserved for conversion of the preference shares and 15,000 common shares reserved for conversion of preference shares of Consolidated Sand and Gravel, Ltd.

Company.—Owns all of the issued capital stock of the following companies: Standard Paving, Ltd., Kilmer & Barber, Ltd., and National Sand & Material Co., Ltd., and the issued common stock of Consolidated Sand & Gravel, Ltd.

The Standard Paving, Ltd., stock and the common stock of the Consolidated Sand & Gravel, Ltd., was secured by the exchange of shares and the control of the stock pledged for exchange in each case.

Purpose.—The purpose of the present issue was to buy for cash the stock of the other companies and also give the company sufficient additional money to purchase another company for which negotiations are now being conducted.

Earnings.—Net earnings of the combined companies for 1929 after making full allowances, it is estimated, will be in excess of $680,000 which, after paying the preferred dividend on the present issue and the preferred dividend on the $1,200,000 preferred stock of the Consolidated Sand & Gravel, Ltd., will leave $691,000 available for the common stock.

Medusa Portand Dividends

MERGER of the Newaygo Portland Cement Co. of Newaygo, Mich., and the Manitowoc Portland Cement Co. of Manitowoc, Wis., with the Medusa Portland Cement Co. of Cleveland has been declared operative, it was announced recently by E. J. Maguire, secretary of the Medusa company. At the same meeting directors declared a dividend of $1.50 a share on common stock payable Oct. 1 to stock of record Sept. 25 and $1.50 on new preferred stock.

The common dividend will be payable on 177,523 shares. The Newaygo Company had 4431 shares of $100 par preferred stock and the deal called for an exchange of at least 51% of this issue. Medusa authorized an issue of 5000 shares of preferred to take care of the exchange.—*Cleveland* (Ohio) *Plain Dealer.*

Canada Gypsum Dividend

FOLLOWING the recent stock split-up on a basis of four to one, the directors of the Canada Gypsum and Alabastine Co., Ltd., Paris, Ont., announced the raising of the common stock dividend rate to $1.50 per year. This raise is double the previous rate. Details of the recent financial activities were reported in ROCK PRODUCTS, August 31, 1929.

Use of Lime in the Food Industries*

By Alfred B. Searle

THE FOOD INDUSTRIES in which lime is employed are those concerned with the manufacture and particularly the clarification of sugar, glucose, lactose or milk sugar, dextrin, saccharin, starch, bread, malt, edible oils, fats, gelatin and jellies.

Sugar Manufacture

In sugar manufacture, either ground quicklime, hydrated lime or milk of lime is added to the crude sugar-juice of syrup, in order to form a compound of lime and sugar, known as calcium sucrate, which is soluble in water. The mixture is well stirred and afterwards carbon dioxide gas is pumped through the liquid so as to remove any excess of free lime which may be in solution and to carry down with the precipitated calcium carbonate and calcium salts of organic acids, the various proteins and pectines and other coloring substances. The juice is then filtered and, as the greater part of the coloring matter has been removed, the product is almost colorless. The treatment with lime is sometimes repeated two or even three times, and by this means a solution is obtained which, when decomposed in a suitable manner, yields white sugar instead of the dark-colored and somewhat nauseous material obtained from the first juice when no lime is used.

The precipitated carbonate is sold for use as a fertilizer.

Lime is the best defecating agent for sugar-cane juice because of its ability to neutralize the acids present, and to precipitate the phosphatic material and much of the organic non-sugars which hinder the crystallization of the sugar at a later stage in the manufacture.

An excess of lime must be avoided, as this, at the high temperatures used, causes destruction of the reducing sugars and produces dark-colored melassigenic substances which hinder crystallization.

Too little lime allows some free acid to remain in the juice, causing partial inversion of sucrose, and also fails to effect the precipitation of impurities, so that the final yield of sugar is reduced.

Most works use a wrong amount of lime. The point of maximum precipitation is one-third to two-thirds of the way between alkalinity to litmus paper and alkalinity to phenolphthalein. Its exact point can be determined by adding milk of lime (containing 1 g. of lime in 100 cc. of water) in doses of 1 cc. or less to 100 cc. of the juice, boiling, filtering and testing the filtrate with a further small quantity of the milk of lime.

In Cuba about 2 cc. of such milk of lime per 100 cc. of juice will insure neutrality to litmus and 4 cc. to phenolphthalein. The point of complete precipitation is between 2 and 4 cc.

When milk of lime is used in sugar manufacture it should have a specific gravity of 1.205 and contain about 25% of lime. Some manufacturers claim that the use of milk of lime involves less loss of sugar than any other form of lime, but this statement does not apply to hydrated lime. Other manufacturers claim that quicklime is more readily soluble in sugar solutions than lime in the form of hydrate or milk.

High Calcium Limes Preferred in Sugar Processing

A fat lime, with little or no magnesia, is preferred, as magnesium carbonate is soluble in sugar-juice and causes trouble later by being deposited on the evaporator-tubes. In the British West Indies, Natal and South America large quantities of lime are used for sugar purification. In these countries it is usually purchased as Bristol lime (a term remaining from the days when it was shipped exclusively from Bristol), but most of the lime now used is from other localities. Any fat lime containing at least 98% of calcium oxide is suitable, provided it is not overburned and so excessively slow in slaking.

Some sugar manufacturers prefer quicklime because the heat it generates on slaking tends to raise the temperature of the sugar-juice. This is of much less importance than is generally supposed, and the risk of forming an insoluble sucrate by local overheating of the juice must not be overlooked.

Molasses contains a large amount of sugar of such a nature that it cannot be obtained by direct crystallization. In what is known as the Elution process, the molasses is mixed with 25% of its weight of quicklime in an artificially cooled edge-runner mill; the temperature of the mixture is then allowed to rise to 100 deg. C., when the sugar and lime combine to form an insoluble saccharate ($3CaO \cdot C_{12}H_{22}O_{11} \cdot 3H_2O$) which sets to a hard, porous mass. The saccharate is extracted with weak alcohol, which removes the impurities, and the residual, purified saccharate is then decomposed by carbon dioxide. Various modifications of this process are used, but in each of them lime is employed to form a tricalcium saccharate of low solubility in water.

Strontia is often used instead of lime; it is more costly, requires a higher burning temperature to convert its carbon into strontium oxide, and the latter has a greater effect on the kiln; these factors greatly reduce the gain due to the greater insolubility of strontium saccharate as compared with calcium saccharate.

The most suitable lime for the purpose is one containing at least 98% of calcium oxide. It must slake readily and completely. Hydrated lime may also be used and is more convenient than quicklime.

Use in Dextrin and Glucose

In glucose and dextrin manufacture, starch is boiled with dilute sulphuric acid and so converted into crude glucose. To the solution thus produced, hydrated lime or milk of lime is added in slight excess to precipitate the acid. The solution is then filtered and the sugar recovered by evaporation. In some works, chalk is used to effect the greater part of the neutralization and lime the remainder. This is supposed to be a cheaper method, but when the cost of dealing with the additional sludge and the loss due to frothing and uncertainties in the treatment are taken into account, it will usually be found that hydrated lime is more economical and much more satisfactory technically.

Lump lime, roughly slaked in water, is often employed, but hydrated lime is so much more satisfactory in every way that it should always be preferred.

Lactose or milk sugar is obtained from milk by first removing the butter-fat with a cream separator, then warming the milk to 75-85 deg. C. and adding about 10% of milk of lime, which precipitates the casein and any remaining fat. The product is filtered and the solution treated with carbon dioxide, which decomposes the calcium lactosate, the lactose being afterwards recovered by crystallization.

In saccharin manufacture, hydrated lime is used to facilitate the concentration of the crude saccharin.

In starch manufacture, the spent pulp from the separation of starch is mixed with milk of lime prior to pressing it, in order to coagulate the fibers and prevent them escaping and to neutralize any acid present which would facilitate a harmful fermentation.

So long as the "milk" is made from lime of reasonably good quality, the purity is not very important. Only calcium lime should be used, as magnesia is less satisfactory. Hydrated lime is much more convenient and is better in every way than lump lime.

Lime Water Relieves Bread Sourness

In bread manufacture, the use of a little lime water in place of some of the plain water ordinarily used produces loaves which are more spongy, pleasant to the taste, and free from all taint of sourness. Lime water is also used in bread-making to prevent "excessive diastasis during primary fermentation." It has the advantage over alum that it does not retard the fermentation of the

*Reprinted from the *Stone Trades Journal* (Great Britain).

yeast. It also increases the water-retaining power of the flour and enables a given weight of flour to produce a greater volume of bread.

For bread-making a very fine lime must be used. Two ounces of quicklime may be added to 11 gallons of water and the whole stirred up, or an excess of lime may be added, stirred and allowed to settle, the clear liquid being decanted or siphoned off.

Hydrated lime is preferable to quicklime, as it is finer and usually purer, and is more readily dissolved.

The quantity of lime-water required varies with the flour and must be found by trial.

Improving the Germinating Power of Grain Seeds

In malting, lime may be used to improve the germinating power of grain seeds by steeping them in saturated lime-water for 24-48 hours. Quicklime is used as an antiseptic for the bins used for storing corn and barley.

The kilns used in the malting industry are frequently lime-washed inside. Lime-wash is also applied to the iron tanks and cisterns used in the malting industry in order to preserve the water contained in them from putrefaction.

Edible oils and fats are freed from acids and "rancidity" by washing with lime-water, the materials being warmed and well-churned so as to insure thorough admixture. Sometimes milk of lime is used instead of lime-water, as it can neutralize much more acid.

The lime most conveniently used for this purpose is hydrated lime made from lime containing not less than 98% of calcium oxide nor more than 0.3% of iron oxide.

Gelatin and jellies are clarified by means of lime, as described in a later section.

Eggs may be preserved in lime-water, but water-glass is usually easier to use and is more certain. The chief recommendation of lime-water is its cheapness, but this only applies when used on a very large scale and under skilled supervision.

For destroying food of a dangerous character, such as diseased meat, quicklime is sometimes used, the food being laid in a pit or trench dug in the ground, on a bed of quicklime and covered with quicklime as well as mixed with it.

Lime as a Food

Lime as a food: the addition of lime in various forms to food for cattle, horses, etc., is well known, and the beneficial results obtained from it are very striking. Only to a negligible extent is lime similarly used in human food, and its value for this purpose to human beings is worth very careful study.

Lime is not only a constituent of the harder portions of the human body, but it is present in solution in the contents of most cells and in cellular tissues, particularly in the muscles and heart, the white corpuscles in the blood and the gray matter in the brain. An ample supply of lime in the food is therefore essential to health.

Lime-water given to infants greatly increases the strength of their bones and teeth, especially in districts where the water is soft, and it has also proved highly beneficial in cases of tuberculosis and diabetes and after an accident in which one or more bones have been broken. The fear that it may cause ossification or sclerosis of the blood vessels appears to be unfounded.

For food purposes, only hydrated lime or lime-water can be used if lime is to be employed, but for many purposes some form of calcium carbonate, calcium lactate or calcium chloride can be substituted. It must be free from grit and should be made from lime containing not less than 98% of calcium oxide.

City Building Not Up to 1928 Record

DURING the month of July there was $235,663,600 worth of building permits granted in 206 cities, according to the building departments of these cities, as reported to F. W. Dodge Corporation. This amount was 15% greater than the total for June, 1929, and 16% less than that for July, 1928. Ninety-two cities showed increases when compared with their July, 1928, records while 114 showed decreases.

The July total brought the value of permits granted during the first seven months of this year to $1,991,077,200, as compared with $2,174,624,400, for the corresponding period of last year, a decrease of 8%.

Comment on the construction situaiton by the First Wisconsin National Bank, Milwaukee, is as follows:

"Construction contracts for the first half of 1929 fell 12% below the corresponding period of 1928. It is now common knowledge that this was due very largely to decline of speculative types of residential building. Commercial and industrial construction has, on the other hand, been quite active. In July, for the first time this year, total construction contracts exceeded by 12% those of the corresponding month last year. At the same time, residential building, as shown by urban permits, continued its downward trend. The July recovery may or may not signify anything as to the future. There is a well-defined opinion that office building construction, especially in large cities like New York and Chicago, has gone too far ahead of demand, just as hotel construction is now known to have done. Perhaps a long-range guess is justified that in coming months there will be some revival of residential building but more or less slowing down in contracts for office buildings."

Sales of Limestone in the Bedford-Bloomington District, Indiana, 1928

THE SALES of stone for construction from the quarries of the Bedford-Bloomington oolitic limestone district, Lawrence and Monroe counties, Indiana, in 1928, as reported to the United States Bureau of Mines, Department of Commerce, by the producers, amounted to 14,520,960 cu. ft., valued at $17,760,622. This was an increase of 7% in quantity compared with 1927. These figures include 4,520,320 cu. ft. of rough blocks, valued at $2,696,376; 5,745,020 cu. ft. of sawed stone, valued at $4,128,388; 180,050 cu. ft. of semi-finished stone, valued at $353,633, and 4,074,870 cu. ft. of cut stone, valued at $10,582,225. Combinations effected in recent years of firms operating quarries with those operating mills in this district have tended to decrease the sales by the quarrymen of rough blocks by throwing the rough stock quarried by them into their own mills and thereby increasing their sales of finished stone.

Besides the high grade stone quarried chiefly for construction, considerable stone (amounting to 429,890 tons, valued at $302,819, in 1928) used for concrete, road metal, flux, riprap, rubble, glass making, agriculture, etc., is produced in these counties.

Stone sold by quarry operators to the finishing mills of the district and dressed and resold by them in 1928 amounted to 1,177,320 cu. ft., valued at $2,594,224, a decrease of nearly 30% in quantity from 1927. The total sales by these plants included sawed stone, 322,654 cu. ft., valued at $284,034; semi-finished stone, 31,750 cu. ft., valued at $50,526; cut stone, 822,925 cu. ft., valued at $2,259,664.

The accompanying tables show the output of the district for the quarries and finishing mills, for 1927 and 1928, by classes of stone:

LIMESTONE SOLD BY PRODUCERS IN THE BEDFORD-BLOOMINGTON DISTRICT, LAWRENCE AND MONROE COUNTIES, INDIANA, 1927 AND 1928, BY CLASSES

Class	1927 Quantity	1927 Value	1928 Quantity	1928 Value
Construction:				
Rough blocks, cubic feet	5,445,970	$ 3,461,369	4,520,320	$ 2,696,376
Sawed, cubic feet	5,268,060	4,685,844	5,745,020	4,128,388
Semi-finished, cubic feet	(*)	(*)	180,050	353,633
Cut, cubic feet	2,858,920	8,259,957	4,074,870	10,582,225
Total construction, cubic feet	13,572,950	$16,407,170	14,520,260	$17,760,622
Other stone, short tons	423,320	$ 381,455	429,890	$ 302,819
Grand total (quantities approximate, in short tons)	1,407,360	$16,788,625	1,482,610	$18,062,441

*Semi-finished stone included under sawed stone.

INDIANA OOLITIC LIMESTONE SOLD BY MILLS NOT OPERATED BY QUARRY COMPANIES IN THE BEDFORD-BLOOMINGTON DISTRICT, LAWRENCE AND MONROE COUNTIES, INDIANA, 1927 AND 1928, BY CLASSES*

	Sawed		Semi-finished		Cut		Total	
Year	Cubic feet	Value	Cubic feet	Value	Cubic feet	Value	Cubic feet	Value
1927	728,000	$704,732	35,030	$58,056	907,440	$2,883,657	1,670,470	$3,646,445
1928	322,645	284,034	31,750	50,526	822,925	2,259,664	1,177,320	2,594,224

*Includes some stone purchased by quarry operators and milled and resold.

On Concrete Proportioning by Absolute Volumes

SIR—I have noted on page 59 of the April 27 issue of ROCK PRODUCTS, Edmund Shaw's comments on my paper, "The Absolute Basis of Proportioning Concrete and Its Economy," presented before the recent annual meeting of the American Concrete Institute.

Mr. Shaw states (correctly) that my "coarseness modulus is found in the same way as the fineness modulus" (and erroneously) "except that the screens are taken in the reverse order"; and he adds, "it is difficult to see wherein it is better to combine by the coarseness modulus than by the fineness modulus."

There is only one order in which the screens may be used and the only differences between the fineness modulus and the coarseness modulus are that an additional screen, the No. 200, is used for the latter and the proportion retained at a theoretical minimum size (A) is taken as 1.0. The coarseness modulus is, therefore, about 1.97 to 2.00 greater than the fineness modulus, but is not different in character in other respects. It is used in the same manner. The change was made only as a means of co-ordination with the Kitts-Peugh grading equation which comprehends the No. 200 sieve and a minimum size of aggregate limitation (A) which is assumed to be ½ the No. 200 opening. The difference is largely a mathematical refinement and not of essential practical importance in my method of proportioning. The fineness modulus may be used if the refinement is not desired.

Mr. Shaw says further, in regard to the method of proportioning, "it is difficult to see what advantages it has over the method of Stanton Walker, given in a National Sand and Gravel Association's Bulletin about two years ago, which was also based on absolute volumes."

I think that the only similarity is that Mr. Walker employs the water-cement ratio, estimates the barrels of cement per cubic yard, volumes of cement paste and concrete on the basis of the absolute volumes of aggregate, cement and water, and employs the same simple physical relations of weight, specific gravity, volume and density. The difference is that Mr. Walker applies this to arbitrary proportions or to proportions of two aggregates based on the fineness modulus (or coarseness modulus) without employing a grading equation for the use of three or more sizes of aggregates.

Co-ordination of Grading Principles

The important difference is that I have co-ordinated the grading principles of Feret, Fuller, Talbot, Richart, Peugh and Kitts, with the fineness modulus principle of Abrams, with the water-cement ratio principle of Feret, Abrams, and others, with the sand-cement ratio principle of Thacher, with the density or voids relations of Feret, Withey, Moyer, Talbot, Richart, and others, with the absolute volume development of Feret, Talbot, Richart, Walker, Crum and others, with the weight-volumetric procedure of testing aggregates and concretes developed by Tuthill, Wright, Barry, Peugh and myself and including a comprehensive physico-mathematics of concrete materials and mixtures and finally, with the graphical analysis of basic concrete mixtures developed by Tuthill and Peugh. The process of development of concrete physics has been contributed to in all respects by so many individuals that little but improvement, co-ordination and appreciation by further research along these lines remains for originality, and it is seldom possible to credit any individual with more than a small part of any of the developments in concrete physics.

Use of absolute volumes as the basis of measurement and calculations in concrete proportions and research was made by Feret, and published by him in 1897,* and I believe that he was the first concrete physicst to employ absolute volumes in this matter as similarly used by Mr. Walker, myself and others.

Feret's formula is that the sum of the absolute volumes of aggregate, cement, water and air voids in the concrete equals the absolute volume of concrete. A certain proportion of the cement, however, goes into solution with the water so that air voids may generally be neglected and then Ky may be taken as unity in $Kv = Ky\ (Av + Cv + Wv)$ in which Kv is the absolute volume of concrete, Av, Cv and Wv are the absolute volumes of aggregates, cement and mixing water, and Ky is the yield of absolute volumes and is equal to $1 \pm .02 \pm$.

The special advantage that might be claimed for this development of methods of testing and proportioning is that it combines the fundamental principles and theories of Feret, Fuller, Thacher, Abrams, Talbot and a host of others. That is something that was not even remotely accomplished before, and I believe that it is a development in the best interests of the cement, concrete and allied industries and the general welfare. Its advantages are indicated by its use on the production of 1,350,000 cu. yd. of concrete in the first 4⅓ years of its existence. Its success in the production of 100% concrete has been limited only by the measure of acceptance, by the architect, engineer and contractor of the production control arrangements essential thereto.

It is noteworthy that absolute volume, as the fundamental measure of concrete proportions, has the sanction of Feret, Withey, Talbot, Richart, Walker, Crum, Tuthill, Wright, Barry and Peugh, and I concur with the special proviso that these absolute volumes should be weighed out as determined by their specific gravities and moisture contents. Until this is generally accepted I would not expect much progress in concrete technology.

In conclusion I wish to say to Mr. Shaw that I am strongly convinced that the best interests of the concrete industry will be served by looking for the merit in the research and developments of each individual and co-ordinating them, rather than by critical comparisons, rejection of A's theory in favor of B's, when both are correct so far as they go; advocating water-cement ratio versus sand-cement ratio, when they are interrelated, etc., etc.—the great drawback to the development of the knowledge of concrete in the past.

JOSEPH A. KITTS.

San Francisco, Calif.,
May 8, 1929.

*See *Bull. de la Societe d'Encouragement pour l'Industrie Nationale*, 1897, also *Revue des Materiaux de Construction et de Travaux Publics*, March, April and May, 1922.

Edmund Shaw's Reply

The writer's interest in concrete mix design and concrete physics comes from his interest in the production of cement and aggregates, especially in the production of aggregates, and he tries to keep in touch with the latest developments in them to judge, so far as he can what will be the effect on the aggregate industry. The effect of some developments on this industry has been profound; for example, the effect of the use of the fineness modulus on the production of sand. As soon as producers and users understood it and used it in comparing mortar strengths there was an immense improvement in the quality and uniformity of concrete sands produced, practically everywhere in the United States.

The effect of developments in concrete-mix design has not been so marked on the production of coarse aggregate because the market did not generally demand carefully prepared materials. Where such a demand did exist producers found methods to supply aggregates that were uniform in grading and fineness modulus, within reasonable limits, and sometimes at no extra cost. In other cases an added price had to be secured to cover the cost of recrushing, sampling, inspection and so on. Such aggregates can be combined by the user by the ordinary methods of proportioning with an assurance that the resulting concrete will be reasonably uniform in strength and workability. The paper by L. G. Lenhardt on the concrete lining of the Detroit water-supply tunnel, presented at the 1929 meeting of the

American Concrete Institute, shows how such a method may be used on the largest jobs with thorough satisfaction to everyone concerned.

There were some engineers who preferred to buy whatever aggregates they found available without much regard to uniformity in grading and to combine them to a constant fineness modulus. Walker's paper referred to showed how to do this with some refinements on other practices. So long as the designer saw to it that the mixes resulting from such combinations were plastic and workable, concrete with strengths corresponding to the water-cement ratio (somewhat stronger in later years, owing to the improvement in cement) were produced. Such methods were used on some large and important jobs successfully, and it was this that the writer had in mind when he made the comment referred to above. It was not made to detract from any merit that the method explained by Mr. Kitts might have, but only to point out that the practical results appeared to be the same.

The writer had also in mind that *all* methods of concrete mix design which are based on the screen analyses of the aggregate have less importance as field methods than they once had. The tendency of engineers is to discard them in favor of the trial method. The trial method is the only one recommended in the third edition of "Design and Control of Concrete Mixes," recently published by the Portland Cement Association, and the reason given is, "because it is practical, easy to apply and produces the results desired." Such papers as that of R. B. Young, of the Canadian Hydro-Electric Power Commission, published about three years ago, and the paper of R. E. Robb, read at the 1929 American Concrete Institute meeting, show how the trial method may be made as scientific as any other. The concrete specification advocated in Nathan C. Johnson's series, "This Material—Concrete," recently published in *Engineering News-Record*, really involves a trial method because it could not be used unless the mix was found to be workable.

The Portland Cement Association Bulletin referred to states that methods based on the fineness modulus are not recommended because they "involve tests and calculations which must be made in the field, often under very unfavorable conditions." This objection would apply to Mr. Kitts' method as forcibly as to any other of the kind. However, the writer is willing to concede that there might be circumstances, especially where good commercial aggregates could not be had, under which the extra work of constant sampling, testing and calculating, the extra cost and the possibilities of error might be justified by the improved results obtained. He is also willing to concede the value of the work of Mr. Kitts and his associates on the theory of concrete making, especially since he has given the paper a more intensive study than was possible when reading so many papers for a general review. It is admitted that such a grading equation as that given is a missing factor in the older methods of calculating the mix from the fineness modulus alone, since this sometimes gave harsh mixes that lacked in strength and workability. Series 186 of the Portland Cement Association's studies of the water-cement ratio strength relation showed this plainly. For the failure to point out these things, Mr. Kitts' criticism of the review is justified.

But it is as a field method, for day-by-day application, that Mr. Kitts' method asked consideration, and in spite of the fact that it has been so successfully applied to making many thousand yards of concrete, the writer feels that it is better for the concrete industry as a whole that simpler methods should prevail. The variations in aggregate mentioned in the first part of Mr. Kitts' paper (which he says make his method necessary) exist, but the writer does not believe that they exist to a serious degree in the high grade commercial aggregates that the plants of the better sort turn out. Moisture content cannot be controlled on account of the weather, hence it must be allowed for in the quantity of mixing water used, but other variations can be and are controlled within reasonable limits in the production of the better plants.

This is not an argument for arbitrary proportioning or a hit and miss combining of aggregates, for the proportions of the aggregates available should be carefully determined in advance by trial and calculation. For large and important jobs the minds of the aggregate producer and user should meet on what can be economically produced as well as what is desirable. When this is done the producer will hold himself responsible for furnishing what is specified, either graded or in separate sizes, and the user can combine them in the proportions worked out in advance with the assurance of uniform strength and workability.

The aggregate industry is justly proud of its ability to keep abreast with the developments in concrete engineering and to furnish materials that have had to meet increasingly rigid specifications. The whole concrete art has advanced through its ability to do this. And the writer believes that the commercial aggregates which can now be obtained when they are demanded can be combined in predetermined proportions for as good a practical result as could be had by an elaborate system of sampling, testing and calculation, applied from day to day or even from car to car. If this is not true then all the work and study of aggregate producers to better their product has been in vain.

EDMUND SHAW.

Los Angeles, Calif.
May 22, 1929.

Gypsum Production in Nova Scotia

THE PRODUCTION of gypsum in Nova Scotia has continued to increase steadily from year to year and reached the high level of 972,211 tons for the year ended September 30, 1928. This represents an increase of 14% over that of the previous year, and the total output represents 78% of the whole production of gypsum in the Dominion of Canada. Of the gypsum mined, 8720 tons was calcined in Nova Scotia, while the remainder was shipped in crude form to Montreal and points in the United States.

At the present time there are about 14 gypsum companies operating in the province. Activities are carried on in Hants, Inverness, Victoria and Antigonish counties.

Of these the largest is the Canadian Gypsum Co., which has very large holdings in Hants county and is operating two main quarries. The location of the quarries is favorable to shipping and the gypsum, after blasting, is hauled up an incline track to the top of the quarry and then transferred to the crushing plant which is situated at the shipping wharf. The company owns three steamers which ply between Windsor and New York and carry on a passenger business as well as the transportation of gypsum. The Atlantic Gypsum Products, Ltd., another large producer, took over the property of the P. M. O'Neil Gypsum Co. three years ago. The quarry is located about three miles from Cheticamp and at least three square miles of gypsum bearing land is held under lease. Operations during the year were confined mainly to construction work and development, although a large crusher was installed and some of the finer gypsum was shipped to the United States. A new power plant and shipping pier are being added to the existing property. Other quarries are operated at Walton, Hants county.

Following is a table of gypsum production in Nova Scotia for the year ended September 30, 1928. The comparative volume of output of companies is interesting.

Company and Location	Production, tons Crude	Calcined
Atlantic Gypsum Products Co., Walton	90,017	.....
Atlantic Gypsum Products Co., Eastern Harbor	58,736	.....
Canadian Gypsum Co., Ltd., Windsor	651,442	.....
Connecticut Adamant Plaster Co., Cheverie	19,030	.....
Ingonish Gypsum Co., Ltd., Ingonish	19,311	.....
Iona Gypsum Products Co., Ltd., Iona	5,570	1220
Newark Plaster Co., Ottawa Brook	.....	.....
North American Gypsum Co., Ltd., Baddeck	5,771	.....
N. S. Coal and Gypsum Co., Ltd., Mabou	14,590	.....
Windsor Gypsum Products Co., Ltd., Newport Station	21,309	.....
Windsor Plaster Co., Ltd., Windsor	9,435	7500
Total	972,211	8720

First Aid Training Proves Big Help

Mills of Portland Cement Association Members Find Bureau of Mines Work Valuable

IN COMPLETING its program of first-aid training in the member plants of the Portland Cement Association which was inaugurated early in the year, the United States Bureau of Mines has contributed another outstanding piece of work on behalf of accident prevention in the rock products industry. In the thoroughness with which it reached nearly all of the cement mills and in the cooperation secured from the various mill and quarry organizations it has been unique.

J. J. Forbes, supervising engineer in charge of the Instruction Section, U. S. Bureau of Mines, who supervised first aid training in 103 cement mills this year

One hundred and three cement mills with their respective quarries participated in the training schedule. Of the remaining mills in the association membership which did not participate, almost all were either shut down or had recently undertaken a similar program independently through the Bureau of Mines or the American Red Cross. Of the mills which completed the first-aid training work during recent months, 76 have made complete reports, indicating a total of 5250 men trained and 120 first-aid teams organized. From these figures it is likely that a total of about 7000 men were trained in all of the mills, or approximately one out of every six operating employes engaged in the industry. In a score or more mills 100% of the employes were enrolled.

In addition to the training represented by the above figures, in which the instruction was given by Bureau of Mines engineers, many of these mills are continuing the courses among additional units of their workmen, using the graduates of the Bureau of Mines courses as teachers. A large proportion of those who completed the Bureau of Mines courses and were awarded the Bureau of Mines certificates are considered fully competent to continue first-aid training in the plants. Through their help it is hoped to carry this instruction to practically all employes who work regularly in the mills and quarries.

Bureau of Mines organization engaged in this work was as follows:

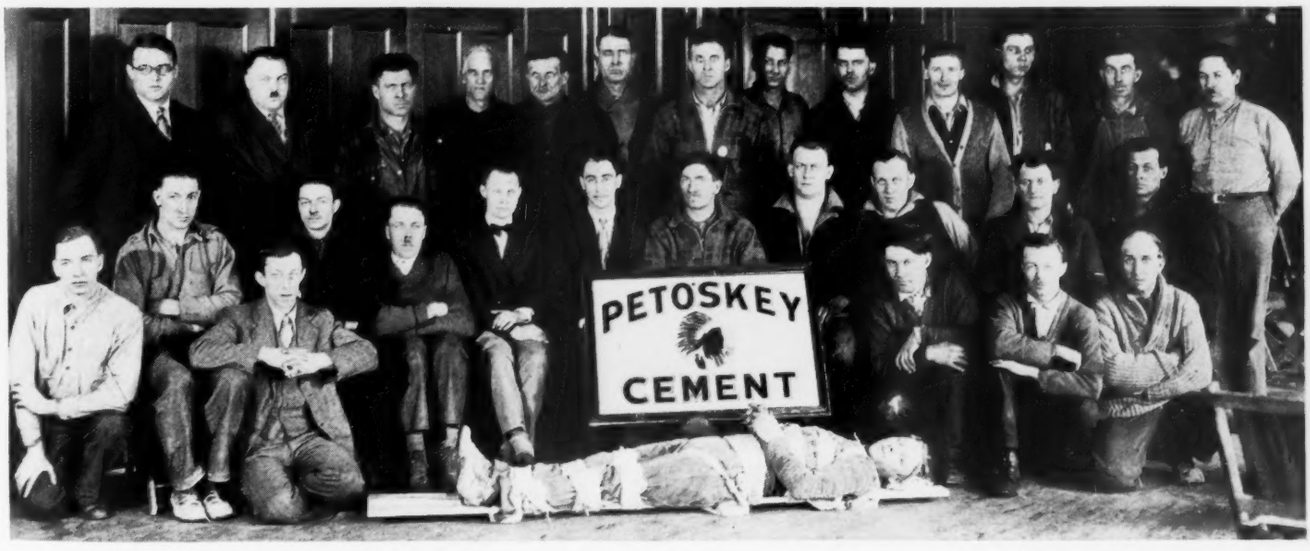
Scott Turner, director of the bureau; Daniel Harrington, chief engineer of the safety division; J. J. Forbes, supervising engineer of first-aid training; Thos. T. Brown, H. R. Burdelsky, F. E. Cash, R. S. Corbin, R. F. Dalrymple, Claud P. Dempsey, J. S. Ferrors, J. M. Harrington, Jesse Henson, C. F. Herbert, J. B. Hynal, H. H. Johns, G. M. Kintz, James McNabb, W. A. Robinson, C. E. Saxon, John Schonning, Emory Smith, R. S. Stegall, A. J. Stromquist, J. Webb, J. S. Westfield, Jr.

All of these men with the exception of Director Turner, Chief Engineer Harrington and Supervising Engineer Forbes have been actively engaged as instructors at the various plants. Where advisable the Bureau of Mines' first-aid and rescue cars were sent to the plants and in every case the bureau instructors remained over as long a period as necessary to train under their personal supervision as many men as desired to enroll.

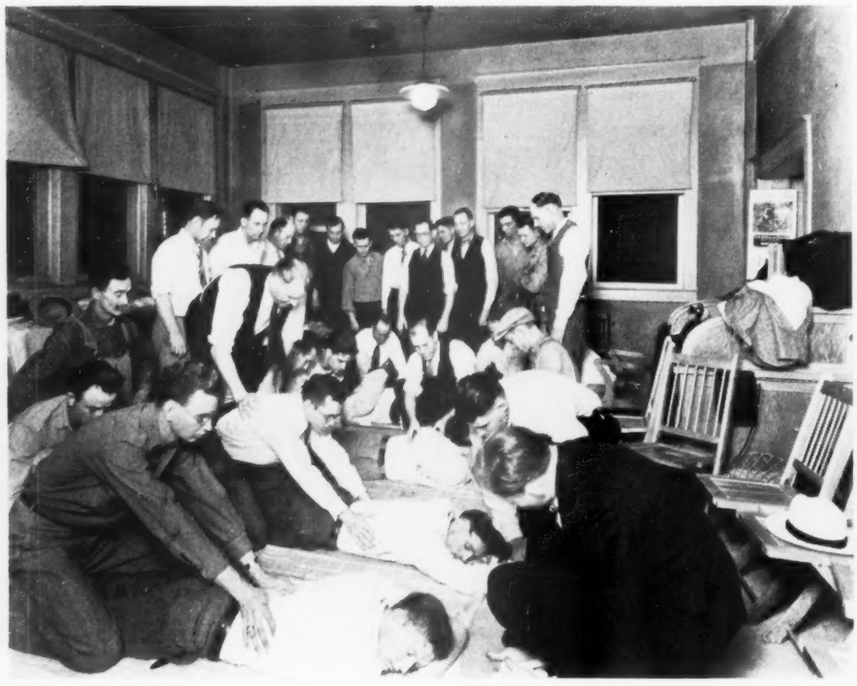
R. D. Currie of the U. S. Bureau of Mines staff who handled many of the eastern classes

Value as Precautionary Measure

It is quite natural that the question be asked: "What results are being obtained from these trained men in the plants?" An investigation recently made by the Portland Cement Association indicates that practical application of the training has been necessary in relatively few cases, but that in these cases it has been efficiently rendered. The large benefits from this training seem to be in the avoidance of accidents which would take advantage of it. The greater a man's



A large group of certificate holders at the Petoskey cement mill



"First aiders" at practice in plant office of the Trinity Portland at Houston, Tex.

knowledge about handling broken legs, for example, the more anxious he is to avoid breaking them. A study of infections and of treatment to prevent infecting wounds or cuts makes men careful to avoid injuries which invite infection. Accidents due to personal ignorance or carelessness are thus put on a rapid decline as the result of a comprehensive first-aid program.

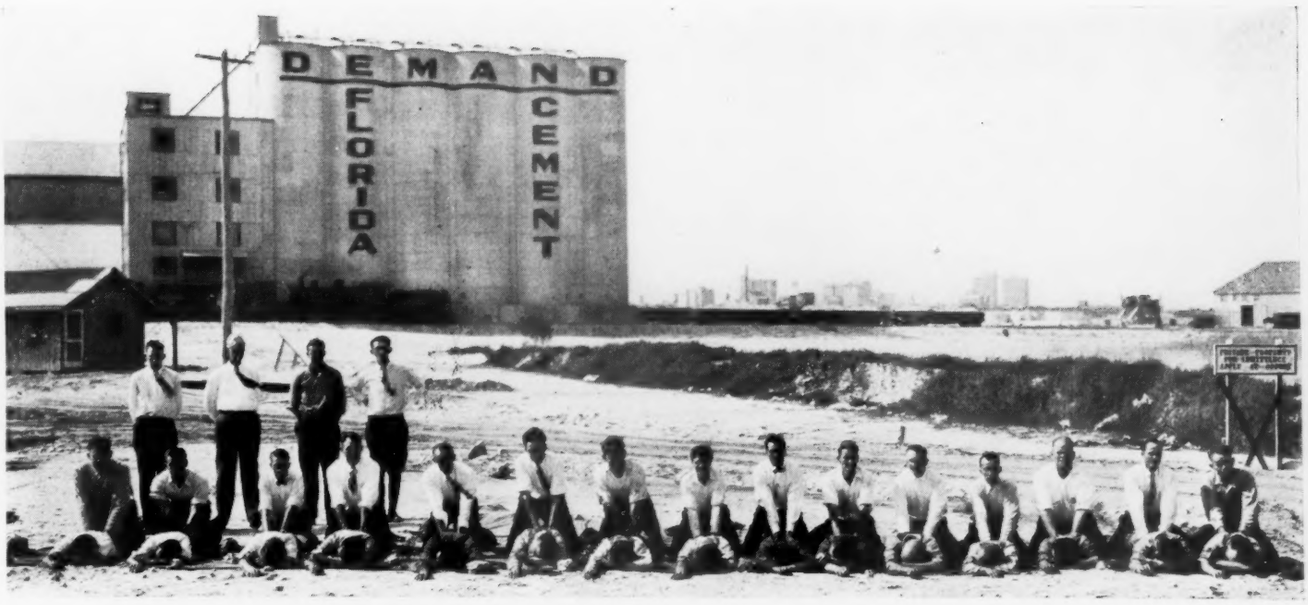
Claude Rodarmel, superintendent of the mills of the Oklahoma Portland Cement Co. at Ada, Okla., recently wrote: "Our first-aid training work has helped materially in putting over our safety program. Nothing has ever been done at the plant which stirred up more real interest in safety than this course."

The 120 active first-aid teams organized during the recent training program are giving local demonstrations and instructions to industrial workers in other lines and to boy scout and other organizations, and are entering many first-aid contests and tournaments.

MILLS WHOSE FIRST-AID TEAMS EXPECT TO COMPETE AT 1930 REGIONAL SAFETY MEETINGS OF THE PORTLAND CEMENT ASSOCIATION ARE AS FOLLOWS

Alpha Portland Cement Co., Bellevue, Mich.
Alpha Portland Cement Co., Ironton, Ohio.
Bessemer Cement Corp. (The), Bessemer, Penn.
Consolidated Cement Corp., Cement City, Mich.
Consolidated Cement Corp., Fredonia, Kan.
Consolidated Cement Corp., Mildred, Kan.
Cowell Portland Cement Co., Cowell, Calif.
Dewey Portland Cement Co., Davenport, Iowa.
Dewey Portland Cement Co., Dewey, Okla.
Florida Portland Cement Co., Tampa, Fla.
Giant Portland Cement Co., Egypt, Penn.
Glens Falls Portland Cement Co., Glens Falls, N. Y.
Huron Portland Cement Co., Alpena, Mich.
Lehigh Portland Cement Co., Birmingham, Ala.
Louisville Cement Co., Speed, Ind.
Lone Star Cement Co., Alabama, Birmingham, Ala.
Lone Star Cement Co., Kansas, Bonner Springs, Kan.
Lone Star Cement Co., Texas, Dallas, Texas.
Lone Star Cement Co., Virginia, Norfolk, Va.
Missouri Portland Cement Co., St. Louis, Mo.
Nazareth Cement Co., Nazareth, Penn.
North American Cement Corp., Howe's Cave, N. Y.
North American Cement Corp., Catskill, N. Y.
Oregon Portland Cement Co., Lime, Ore.
Oregon Portland Cement Co., Oswego, Ore.
Pacific Portland Cement Co., Redwood City, Calif.
Pacific Portland Cement Co., San Juan Bautista, Calif.
Peerless-Egyptian Cement Co., Detroit, Mich.
Pennsylvania-Dixie Cement Corp., Clinchfield, Ga.
Pennsylvania-Dixie Cement Corp., Richard City, Tenn.
Pennsylvania-Dixie Cement Corp., Des Moines, Iowa.
Petoskey Portland Cement Co., Petoskey, Mich.
Santa Cruz Portland Cement Co., Davenport, Calif.
Superior Portland Cement, Inc., Concrete, Wash.
Trinity Portland Cement Co., Dallas, Texas.
Trinity Portland Cement Co., Houston, Texas.
Universal Portland Cement Co., Universal, Penn.
Valley Forge Cement Co., West Conshohocken, Penn.
West Penn Cement Co., Butler, Penn.
Wolverine Portland Cement Co., Coldwater, Mich.
Wolverine Portland Cement Co., Quincy, Mich.

First aid work has taken a firm hold on the workers of the Huron Portland Cement Co.



The first aid teams of the Florida Portland Cement Co. include the general superintendent, James E. Curtis, and superintendent, C. E. Caron

Yosemite Portland Cement Corp., Merced, Calif.

Where Actually Used

A number of the cement mill superintendents have reported situations in which first-aid training has been found extremely valuable within or outside of the plant. A few brief statements from recent experience will be of interest.

F. B. Hunt, electrical engineer of the Nazareth Portland Cement Co., writes: "We have had one case requiring resuscitation. A man overcome by gas was revived by the Shaefer method with no ill effects whatever."

Fred Davis, superintendent of Santa Cruz plant at Davenport, Calif., writes: "Artificial respiration was applied successfully in the case of one of our men who had been suffocated."

A. A. Chaney, superintendent of the Trinity plant at Fort Worth, gives two interesting examples: "Artificial respiration was successfully applied in the case of a man who received a shock from a 2300-volt line. Splints and bandages were applied in case of fracture of lower leg."

E. C. Sweitzer, superintendent, Petoskey Portland Cement Co., reports: "Man working at crusher had arm broken. Crusher men applied splints, treated for shock and properly transported injured to hospital. The doctor complimented the fine first-aid

In a picturesque setting beneath the large kilns, first aid enthusiasts of the Lone Star plant at Houston, Texas, have learned how to aid the victim of almost any possible accident

The first aid teams at the Mildren, Kan., plant of the Consolidated Cement Corp.

work and stated that due to the latter he was able to give the man's arm a perfect set."

Joseph F. Uhlman, safety director of the Pennsylvania-Dixie Cement Corp. mill at Richard City, Tenn., reports two interesting experiences: "First-aid was successfully applied to stop hemorrhage at the head. First-aid was also applied successfully in the case of a lacerated arm where profusion of blood was very dangerous."

E. F. Parker, superintendent of the Pacific Portland Cement Co. at San Juan Bautista, Calif., states that first-aid treatment was recently given in two cases at his mill, the first for burns resulting from an electric arc and the second for cuts and bruises.

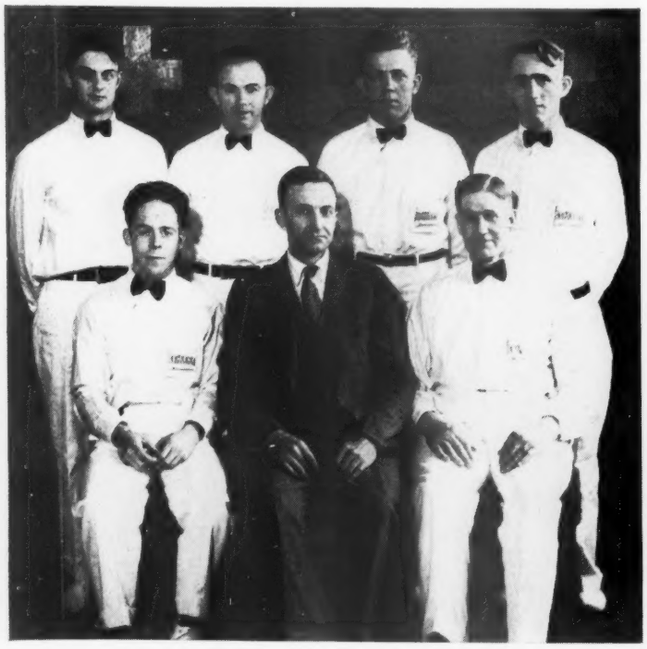
David H. Leche, general superintendent of the Oregon Portland Cement Co., writes: "Falling rock struck man dislocating three vertabrae and x-ray showed two ribs torn loose from spinal column. Due to expert handling, as a result of our first-aid training, we believe that loss of time in this case was materially reduced."

Training Also Valuable to Outside Cases

Alexander S. Bilderback, safety engineer of the Riverside Cement Co. at Riverside, Calif., reports that in addition to providing first-aid to employes of the Riverside mill, several outside industrial cases have been handled, including employes of the Consolidated Steel Co. and the Macdonald Engineering Co. W. H. George, secretary of the Cowell Portland Cement Co. at Cowell, Calif., writes that first-aid men of that mill have recently gone to the assistance of victims of automobile accidents in the vicinity.

R. S. Sutherland, superintendent of the Trinity Portland Cement Co. at Houston, Texas, states: "A man who broke his leg while sliding to third base in a ball game received first-aid from one of our men who was present. The doctor who attended the case commended the work very highly."

A. J. Little, superintendent of the Medusa Portland Cement Co. plant at Bay Bridge, Ohio, wrote recently: "About two weeks ago there was a serious automobile accident on the main highway near our plant at which time one of the occupants was badly cut in the fore-leg by glass from the machine, severing an artery. Had it not been for several of our employes administering first-aid to this man immediately he would have bled to death within a very short time. They applied a tourniquet to the leg and properly transported the patient to the nearest hospital."



North American Cement Corp.'s team at the Howe's Cave, New York, plant

Cup winners of the Yosemite Portland Cement Corp. newly organized team; these men aspire to first-aid leadership

Relation of Coarse Aggregate Content to the Quality of Concrete*

AN INVESTIGATION to determine the effect of variations in the amount of coarse aggregate on the quality of portland cement concrete in pavements constructed with standard equipment has been initiated by the Bureau of Public Roads and a series of nearly 250 slabs is now under construction at the Arlington Experiment Station near Washington. Experience in pavement construction in North Carolina has indicated that, with a close control of grading of the coarse aggregate, it may be possible to use a considerably larger quantity of coarse aggregate than has heretofore been customary and thereby effect appreciable economies in construction costs. It is desirable to investigate the matter by using standard construction equipment for making and finishing full-size test slabs laid under closely controlled conditions.

A single commercial concrete sand of good quality is being used as the fine aggregate in all of the slabs. The following variables have been included in the tests.

(a) Coarse aggregate of three types:

1. Crushed stone.
2. Rounded, uncrushed gravel.
3. Blast furnace slag. To be used with coarse aggregate grading No. 1 only.

(b) Coarse aggregate of two gradings:

1. Material graded from ¼ in. to 2½ in. and containing a proper amount of ¼ to ¾ in. material.
2. In the second grading the crushed stone will be deficient in ¼ to ¾ in. material, but the gravel will carry an excess of this size and will be limited to a maximum size of 1½ in.

The coarse aggregates will be measured in three commercial sizes, as follows: 2½ in. to 1¼ in., 1¼ in. to ¾ in. and ¾ in. to ¼ in.

(c) Six proportions (dry, rodded volumes) as follows: 1:2:3½; 1:2:4; 1:2:4½; 1:2:4¾; 1:2:5; 1:2:5¼;

The addition of coarse aggregate will proceed only to the limit of workability for each aggregate. It is not expected that it will be feasible to use as much crushed stone or slag as gravel.

(d) Three consistencies are being used ranging from the driest which can be placed and finished to a relatively wet mix which can be handled easily.

(e) Two finishing machines are being used.

The pavement slabs are 9 ft. square and 7 in. thick and are placed with the use of steel side forms. Mixing, placing and finishing of the concrete is in accordance with modern paving practice using standard equipment.

The slabs are divided longitudinally by dummy joints or planes of weakness and the various sections are separated by transverse headers. The mixing time is one minute. The slabs are covered with wet burlap for 24 hours, followed by wet earth for 10 days. Detailed observations are being made as to consistency, workability and yield.

After curing the slabs are to be drilled for cores and subdivided into beams suitable for flexure tests. The strength tests will be made at an age which will be determined later.

Supplementary tests are also to be made on beams and cylinders cast at the time the pavement slab is placed. These tests should yield data as to the relationship between the strength of molded specimens and that of specimens cut from pavement slabs.

*Public Roads, August, 1928.

Over 21,000 Miles of Road to Be Built in 1929

A CENSUS of state highway departments just completed by the American Road Builders Association shows an estimated 21,664 miles of roads to be constructed this year in 42 states.

A questionnaire was sent to all states and figures received from all except Connecticut and Nebraska indicate $744,266,000 available for maintenance and construction this year. This sum includes highway funds apportioned by the federal government to the states, and funds raised by gasoline taxes, motor vehicle registration and various other methods.

The estimated county expenditures for 1929 are shown to be $405,150,000 in 40 states. This added to the state funds shows a grand total of $1,149,416,000, which is a conservative figure of the total money that will go into good roads during 1929 or the fiscal year 1929-30. The Bureau of Public Roads estimate is $1,315,000,000.

In hard surface building Iowa, which now has 1900 miles, heads the list of states in mileage to be constructed and will pave 750 miles each year in 1929-30-31, making a total of 4150 miles of paved road.

Kansas has a 1929 construction program with a total of 1875 miles, which included 800 miles of grading, 1000 miles of sand and gravel and 75 miles of hard surface.

New York, with 10,840 miles of all types of road, will add 700 miles this year and "700 plus" in 1930.

Ohio, with 6660 hard surfaced and 3837 miles of gravel roads, will add 300 miles this year.

Pennsylvania, with 7485 miles hard surfaced in her total mileage of 12,756, will add 500 miles in 1929.

Texas, with 18,000 miles of all types, will add 800 miles this year and "probably the same" in 1930 and 1931.

West Virginia will add 360 miles of hard surface each year over the three-year period. Wyoming will add to her present 39 miles of hard surfaced roads 390 miles—of all types—in 1929 and 375 miles each in 1930-31.

Michigan, with 3452 miles of all types, will build 560 miles this year and 500 each in 1930-31, making a total of 5012 miles.

Alabama expects to build 1100 miles of road in 1929. Illinois this year will add 600 miles of hard surface to her present 7525.

Kentucky will hard surface 382 miles of road this year and expects to exceed this program in both 1930 and 1931.

North Dakota, which now has only 15 miles of hard surfaced roads, will build 1000 miles of all types annually in 1929-30-31.

Missouri will build 1291 miles, all types, this year and follow next year with 917 miles more, giving that state a total of 2876 miles hard surfaced.

Mississippi is the only state which has no funds nor estimate for construction this year. The state has matched federal aid with county bond issues in past years, but several proposed bills this year have failed, according to the state highway department.

The census further shows that in 22 states all construction is by contract, 23 states employ some day labor, when bids are too high, in emergencies, and on small projects, and convict labor is used on roads in Florida, Michigan and Virginia.

At least six states divide gas tax between the state and counties, Florida giving the counties 4 cents of her 6-cent tax and Mississippi giving the counties 3 cents out of 5. In the others, the states take the larger proportion.

Eight states hope to secure funds for road construction by bond issues in the near future. New Mexico and Maine expect to complete bond issues this year, Mississippi anticipates an issue in 1930, Maryland and Iowa in 1931, the latter for $100,000,000—Alabama and Georgia are desirous of issuing bonds with the latter state seeking $100,000,000.

Sand Plant Alleged Nuisance

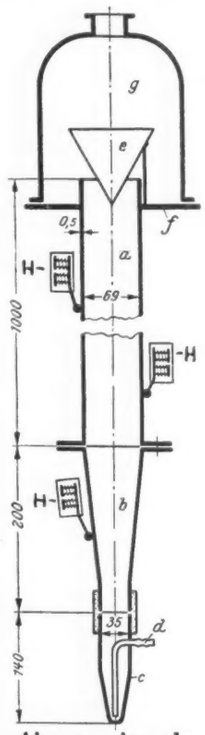
A CERTAIN gravel company in western Pennsylvania was given notice by the city council of the city in which it is located to take steps which would eliminate alleged nuisance created by operation of its equipment. The order was based on a petition filed by neighboring residents who complained that the smoke from the steam shovel and the noises of operation rendered their homes untenable.

Fatality at Underground Gypsum Mine

LOADING a car in a tunnel 50 ft. underground at the Clarence, N. Y., mines of the National Gypsum Co., James Sacks, 24, of Corfu, was crushed to death when a slab of limestone fell without warning from the roof of the tunnel.—*Buffalo* (N. Y.) *News.*

Foreign Abstracts and Patent Review

Air Separation of Fine Ground Rock Products—Dr. H. W. Gonell describes briefly the various processes used for determining the granular composition of various materials, of which the air-screening process at normal room temperature is preferable; and he presents an improvement upon the Pearson and Slight apparatus described in Technological Paper No. 48 of the Bureau of Standards (1915). As shown herewith, this apparatus consists of the brass cylindrical tube *a*, the brass cup-shaped portion *b*, the glass extension *c*, the glass tube *d*, the cone *e*, the plate *f* and the glass bell jar *g*. The pulverized material is weighed into the glass extension *b*: air is then supplied by an air pump through the glass tube *d*, which reaches nearly to the base of the glass extension. The fine particles are raised by the air current without adhering to the polished surfaces and smoothed joints; the apparatus is rapped during operation by clappers from electric bells *h* to assure no adherence of dust to the inner surface. Eddies are prevented and better aeration of the material is asured by the cup shape of part *b*, the air current then carries the dust through cylinder *a*, above which it is deflected by the cone *e*, the air escaping through the vent in the bell *g*, while the dust deposits on the plate *f*. The air supply is accurately adjustable, being regulated by several gaged nozzles of different diameters and by air pressure control. The degree of fineness is determined by the percentage of residue of the initial quantity remaining in the glass extension *c*. The test is discontinued after only 0.5 to 1.0% of the material can be screened in ½ hour. Tables and diagrams of the results in screening several portland cements show that these results check with those obtained in microscopic tests. For grain sizes of less than 10 microns, the air screening lasts 5 hours, and the maximum deviations in test results are within 3%.—*VDI-Zeitschrift* (1928), **72**, 27, 945-50.



Air-screening device for fine ground rock products

Rotary Screen. The apparatus is in the form of a trommel, the screening surface comprising a number of rollers parallel to the axis. The end spiders (driven by the shaft) are formed into sun-pinions, each roller being provided with a pair of planet-pinions at each end, one of each pair gearing with outer, fixed, internally-toothed rings and the other of each pair with the sun-pinions. The rollers rotate about their own axis, also about the central shaft, but at a slower speed than the end spiders; internal scoops may be provided rotating with shaft and spiders, and therefore having movement relative to the screening surface. —*British Patent No.* 303,970.

Slow-Setting Aluminous Cement. The setting of a highly aluminous cement (so quick-setting as to be unusable) is delayed by the addition of a small amount of a colloid such as casein, albumin, gum, gelatin, etc.—*British Patent No.* 294,111.

Treatment of Concrete Surfaces. The surface of the mould is treated with a solution of the products of the alkaline hydrolysis of albumins or proteins (*e. g.*, alkali salts of lysalbic and protalbic acids). This treatment delays the local setting of the binding agent, so that the surface layer of the material may be washed off when the mould is removed. — *British Patent No.* 312,216.

Magnesite Brick—Magnesite brick contain 80 to 90% of magnesia and 4 to 8% of iron oxide. The percentage of magnesia in different brick varies from 83 to 96%. The matter insoluble in acid does not exceed 3% and in most brick was negligibly small. The silica varies from 0.8 to 5.1, alumina from 0.2 to 2.2, iron oxide 0.2 to 8.6, manganese oxide 0.0 to 1.4 and lime 0.4 to 2.7%. The water-absorption varies from zero to over 12%, the porosity from 15 to 28%, the specific gravity from 3.54 to 3.65% and the volume weight from 2.18 to 3.47%. The softening point under a pressure of one atmosphere commenced at 1350 to 1790 deg. C. collapse occurring at 1390 to 1700 deg. C., and the range of softening extended from 40 to 320 deg. C. The maximum expansion at 1300 deg. C was 0.5 to 2.17%; the increase in length after being fired four times at cone 17 was 0.03 to 0.1%, but some brick shrank 3.2% under the same conditions. An abrasion test showed that the weight of material removed varied from 0.3 to 3.68 g, per sq. cm. The crushing strength when cold was 88 to 860 tons per sq. ft., and that at 1200 deg. C., 85 to 560 tons per sq. ft. Such great variations made specifications difficult because some of the figures relate to odd brick and are not applicable to large numbers. The ordinary test for refractoriness is of small value in comparing magnesite brick, but the refractoriness under a pressure of one atmosphere is valuable. Under this test, only the poorest magnesia brick show any signs of collapse under 1500 deg. C., and the better ones remain unaltered to 1800 deg. C. Most magnesia brick collapse somewhat suddenly when the critical temperature is reached, though brick of poor quality have a softening range of about 300 deg. C., and the better brick about 50 deg. C. The effect of any iron oxide present in the brick is most noticeable in the way it produces a rounding of the curve in a "refractoriness - under - small - load" test, though other fluxes may have a similar effect, one brick containing 95.4% of magnesia and only 1% of iron oxide showing as much "rounding" as another brick with more than 7% of iron oxide. The presence of both silica and iron oxide is objectionable, as they have a greater fluxing action than either substance separately. The best brick contains 5.7% of iron oxide and a very small percentage of silica. If a purer magnesite is used, it must be fused electrically and care taken to secure the maximum density by careful attention to details during the manufacture of the brick as well as by firing them at a very high temperature. A microscopic examination of thin slices of magnesite brick does not always show marked differences between them. While some brick produce typical micrographic specimens, others give uncertain indications. The X-ray spectrum of magnesite brick shows that some periclase is present even in lightly-fired caustic magnesia, though it is the chief constituent in magnesia which has been electrically fused. Poor magnesite brick show spectral lines not present in good brick. The fact that caustic, sintered and fused magnesia all give the same X-ray spectrum is significant, because it shows that prolonged heating does not bring about any unexpected change in the material; it only increases the proportion of periclase (crystalline magnesia) present.—*Refractory Journal* (1928), **4**, 259, and *Ceramic Abstracts* (1929), **8**, 584.

Dry Separation of Materials. A reciprocating table, having a crinkled perforated deck and perforated tapering riffles, is described, which is previous to upward air currents. Adjustable "pneumatic skimmers" or horizontal cross-jets of air are provided above the table.—*British Patent No.* 307,526.

Cellular Building Materials. A mixture of clay, etc., previously baked at 200—1100-deg., cement, unbaked clay, and, *e.g.*, powdered aluminum, made to a paste with water, is dried in moulds rendered waterproof, *e. g.*, by greasing, and the moulded blocks are calcined at about 1300-deg.—*British Patent No.* 312,764.

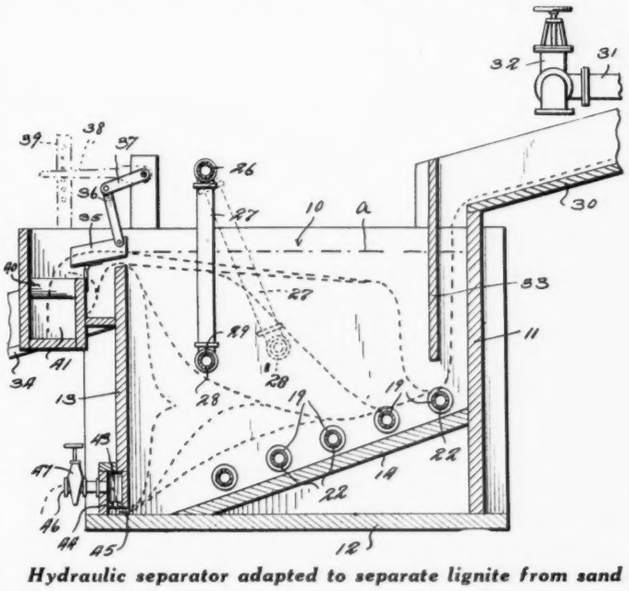
Concerning Alit—E. Jaenecke defends himself against Dr. H. Kuehl (*Zement*, 1928, **17**, 35, pp. 1303-05) by reviewing some of his experimentally obtained data.—*Zement* (1928) **17**, 45, pp. 1626-27.

Recent Process Patents

The following brief abstracts are of current process patents issued by the U. S. Patent Office, Washington D. C. Complete copies may be obtained by sending 10c to the Superintendent of Documents, Government Printing Office, Washington, for each patent desired.

Preparation of Dry Ground Limestone. In the manufacture of dry ground limestone suitable for fertilizer purposes, the process which comprises mixing moist limestone with quicklime and then grinding the mixture produced thereby to form a pulverulent material, the amount of quicklime added being such that the said pulverulent material will not contain sufficient free moisture to form a hard solid cake when subjected to a temperature below freezing.—*W. E. Carson, U. S. Patent No.* 1,721,803.

Hydraulic Separation. A novel method of hydraulic separation which has been designed especially to separate coal from slate and shale, could be applied in the rock products industries to separate lignite from sand. The apparatus would also function as a hindered settling classifier. The device has a tank with an inclined false bottom above which are pipes connected with a pump through a header pipe. The discharge of the pump through holes in the pipes creates a rising current which assists in the separation. But in the main the density of the sand and water mixture, which may have a specific gravity greater than that of coal, is relied upon to float off the coal, and this density is maintained by returning a part of the coal to the pump. This coal is taken off at the upper part of the overflow by a skimmer which discharges into a box that is connected with the pump suction, and a greater or less quantity is skimmed off as may be needed to maintain the required density.



Hydraulic separator adapted to separate lignite from sand

In addition to the pipes above the false bottom there is another pipe with holes which is connected to the pump suction. This is swung from a flexible joint so that it may be placed in any part of the tank where a dead space would otherwise be formed.—*H. H. Carl et al.* April 23, 1929. 1,710,568.

Rapid-Hardening Cement. Raw cement materials are mixed in such proportions as to secure in the finished cement an hydraulic modulus of not less than 2.20 and a silica modulus of less than 3.00. The mixture is ground to a fineness exceeding 95% passing a 200-mesh screen, burned to sintering, and the resultant clinker ground to a fineness exceeding 95% passing a 200-mesh screen. To the ground clinker so much calcium sulphate is added that the content of sulphuric acid anhydride exceeds 2% in the finished cement.—*C. Pontoppidan, assignor to F. L. Smidth and Co., New York,* U. S. Patent No. 1,722,486.

Asbestos Cement. A cement comprising approximately two parts, by weight, of asbestos and one part of oxide of zinc mixed with sufficient water glass to make a heavy paste.—*B. W. Tuttle, U. S. Patent No.* 1,719,944.

Cellular Gypsum Plaster. The process employs a dry mixture of partially calcined gypsum as the major ingredient, a water soluble bicarbonate such as sodium bicarbonate, magnesium silicofluoride, hydrated lime and powdered soap bark. This mixture is gaged with water and the resulting plastic mass on setting hardens into a strong cellular material.

The use of hydrated lime tends to preclude or minimize efflorescence; the carbonate is the gas-producing agent; the soap bark is used to produce foam and entangle the gas bubbles in the plastic mass; the silicofluoride reacts with the bicarbonate to produce a gelatinous precipitate of silica hydrate which after aging of the finished product becomes crystalline and further strengthens the cellular structure.

To produce a cellular gypsum weighing 24 lb. per cu. ft. the inventor uses these proportions:

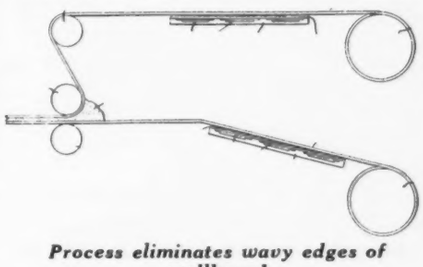
	Parts
Calcined gypsum	100
Sodium bicarbonate	1.75
Magnesium silicofluoride	2.0
Calcium hydroxide	0.5
Powdered soap bark	0.05

If it is desired to produce a cellular structure possessing a weight of approximately 12 lb. per cu. ft., the following proportions are used:

	Parts
Calcined gypsum	100
Sodium bicarbonate	2.8
Magnesium silicofluoride	3.0
Calcium hydroxide	0.5
Powdered soap bark	0.12

Different weights per unit volume are produced by varying the proportions of the above ingredients.—*H. E. Brookby,* U. S. Patent No. 1,720,032.

Eliminating Wavy Edges of Wallboard—The author calls attention to the fact that paper used for production of gypsum wallboard has a moisture content of about 4% when it leaves the paper mill and that the rolls later absorb additional moisture from the air. The edges of the tightly wound rolls naturally absorb more water than the center portions, hence on expanding they impart to the paper a wavy edge.



Process eliminates wavy edges of wallboard

If paper with a wavy edge is used for wallboard the resulting board will also have a wavy edge, a most undesirable feature. To eliminate this condition the author of the patent proposes to pass the paper over suitable and preferably electric heating units in such a manner that the paper will have a uniform moisture content and hence a true edge before the plaster gypsum is added ahead of the forming rolls.—*Gilbert A. Hoggatt, assignor to Certain-teed Products Corp.* U. S. Patent No. 1,709,475.

Concrete Block. The method of making dense, coherent, non-absorbent concrete which comprises mixing cement and a mineral aggregate of at least two sizes and including a fine powder, initially adding all the water that is ever added and mixing, forming an outer skin of cement and finer portion of the aggregate upon the mass by molding and tamping thereby confining water in the interior, permitting the interior to set, and splitting the mass to provide a surface resembling stone.—*R. B. Kenworthy, U. S. Patent No.* 1,723,043.

Traffic and Transportation

Car Loadings of Sand and Gravel, Stone and Limestone Flux

THE following are the weekly car loadings of sand and gravel, crushed stone and limestone flux (by railroad districts) as reported by the Car Service Division, American Railway Association, Washington, D. C.:

CAR LOADINGS OF SAND, GRAVEL, STONE AND LIMESTONE FLUX

District	Limestone Flux Week ended Aug. 10	Limestone Flux Week ended Aug. 17	Sand, Stone and Gravel Week ended Aug. 10	Sand, Stone and Gravel Week ended Aug. 17
Eastern	3,804	3,747	17,920	19,242
Allegheny	3,737	4,526	11,219	11,278
Pocahontas	404	446	1,505	1,476
Southern	574	665	10,736	10,461
Northwestern	1,389	1,255	10,094	10,611
Central Western	510	647	15,108	14,647
Southwestern	533	576	8,223	8,508
Total	10,951	11,862	74,805	76,223

COMPARATIVE TOTAL LOADINGS, BY DISTRICTS, 1928 AND 1929

District	Limestone Flux 1928 Period to date Aug. 18	Limestone Flux 1929 Period to date Aug. 17	Sand, Stone and Gravel 1928 Period to date Aug. 18	Sand, Stone and Gravel 1929 Period to date Aug. 17
Eastern	91,754	106,680	308,925	320,655
Allegheny	106,556	113,728	218,413	210,157
Pocahontas	14,731	12,363	25,912	28,797
Southern	18,448	17,133	341,122	284,296
Northwestern	42,623	34,396	199,251	182,912
Central Western	13,651	16,866	324,741	321,155
Southwestern	13,534	15,182	194,450	205,329
Total	301,297	316,348	1,612,814	1,553,301

COMPARATIVE TOTAL LOADINGS, 1928 AND 1929

	1928	1929
Limestone flux	***301,297***	***316,348***
Sand, stone, gravel	***1,612,814***	***1,553,301***

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week beginning September 7:

SOUTHERN FREIGHT ASSOCIATION DOCKET

46844. **Limestone, crushed or ground,** to be used as a transit ingredient in the manufacture of mixed feed. Amendment of Item 45 of Agent Speiden's Transit Rules Tariff, I. C. C. 1285. It is proposed to eliminate paragraph "C" of Note 3 of Item 45, page 10, Agent Speiden's Tariff 170-C, applying on limestone, crushed or ground, reading that "the surrender of two-piece freight bills or other inbound tonnage records shall be required and each such freight bill shall be canceled in proportion to the total weight of the limestone entering the mixture, one freight bill covering the limestone and one freight bill covering the grain or grain products," thereby allowing one freight bill to be surrendered for the outbound movement.

46849. **Limestone, ground or pulverized,** from Cartersville, Ga., and Sparta, Tenn., to Oaks, Penn. Lowest combination rates now apply. Proposed rates: From Cartersville, Ga., to Oaks, Penn., on calcite, ground (ground limestone), carloads, minimum weight 60,000 lb., 601c per ton of 2240 lb.; from Sparta, Tenn., to Oaks, Penn., on limestone, ground or pulverized, carloads, minimum weight 67,000 lb., except where marked capacity of car is less, in which event marked capacity of car will be the minimum weight, 560c per net ton. Proposed rates are the same as the current rates to Philadelphia, Penn.

46862. **Soapstone, ground, etc.,** from Esmont, Va. (when from Nelson and Albemarle Ry. stations), to Gadsden, Ala. It is proposed to establish rate of 430c per net ton on ground, crushed or pulverized soapstone, carloads, minimum weight 60,000 lb., from and to the above named points, same as rate suggested under Submittal 45928 from Rockfish, Va., to Gadsden, Ala., for similar application.

46866. **Glass sand,** from Goshen, Va., to Kingsport, Tenn. Combination basis now applies. Proposed rate on glass sand, carloads (See Note 3), from Goshen, Va., to Kingsport, Tenn., 200c per net ton.

46950. **Sand,** from Hollow Rock, Tenn., to Bruceton, Tenn. Present rate, 57c per net ton. Proposed rate on sand, carloads, minimum weight as per Item 35-A, N. C. & St. L. Ry., I. C. C. 3091-A, from Hollow Rock, Tenn., to Bruceton, Tenn., 50c per net ton. (Intrastate only.) Based on the scale prescribed by the Interstate Commerce Commission in Docket 17517.

Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

46968. **Phosphatic limestone,** from, to and between southern points. It is proposed to amend the descriptions covering all rates on phosphate rock from, to or between points in southern territory to specifically indicate that such descriptions include phosphatic limestone. For example, the description applying generally in connection with rates published in L. & N. R. R. I. C. C. A15803 should be amended to read: "Phosphate rock, crude lump, or phosphate rock, crude ground (including phosphatic limestone), in bulk or in bags, carloads."

46997. **Sand,** from Sand Pit, Va., to Tarboro, N. C. Present rate, 165c per net ton. Proposed rate on sand, carloads, subject to present description and minimum weight, from Sand Pit, Va., to Tarboro, N. C., 150c per net ton, constructed on basis of Docket 17517 scale, plus 25c per ton.

SOUTHWESTERN FREIGHT BUREAU DOCKET

18260. **Gravel,** from Howden, Okla., to points in Oklahoma. To establish a rate of 4½c per 100 lb. on gravel, carloads (See Note 1), except when loaded to full visible capacity of car actual weight but not less than 50,000 lb. will apply, from Howden, Okla., to Wann, Wayside, Dewey and Bartlesville, Okla. The above rate, it is stated, is to take care of an emergency movement and unless a reasonable rate is made effective in the very near future, the movement will be by truck and the carriers will lose the business altogether.

18279. **Chatt, gravel,** etc., between points in Kansas and points in Oklahoma. To establish the scale of rates on commodities outlined below, as prescribed by the Interstate Commerce Commission in Docket 17000, Part 11, between points in Kansas and points in Oklahoma; rates to be assessed on basis of actual mileage via route of movement:

Chatt (mine gravel), whole or crushed;
Crushed stone (broken stone ranging in size up to 200 lb. weight each), including ground limestone in bulk or in bags, but not including gypsum rock;
Gravel;
Rip rap (irregular shaped rock in pieces ranging up to 200 lb. in weight);
Sand (except asbestos sand and silica sand);
In straight or mixed carloads.
(See Note 3.)

It is contended that if the basis prescribed in Docket 17000, Part 11, is reasonable basis between points in the Southwest, there is no apparent reason why same scale should not be applicable between points in Kansas and Oklahoma.

18344. **Sand,** from Guion, Ark., to Beaumont, Texas. To establish a rate of 16½c per 100 lb. on sand, as described in Item 6468, page 395, S. W. L. Tariff 2L, I. C. C. 1906, or as same may be amended in compliance with I. C. C. Docket 17000, part 11, carloads. Minimum weight, 80,000 lb., except where marked capacity of car is less, in which case marked capacity of car will apply, from Guion, Ark., to Beaumont, Tex. It is desired to place to Beaumont, Tex., the same rate as applicable to Houston, Tex.

ILLINOIS FREIGHT ASSOCIATION DOCKET

5152. **Sand and gravel,** carloads, usual minimum weight, from Hammond, Ill., to De Kalb and Chase, Ill. Rates per net ton:

To	Pres.	Prop.
De Kalb, Ill.	$1.40	70c
Chase, Ill.	1.47	90c

5158. **Sand and gravel,** carloads (See Note 3), but not less than 40,000 lb., from Hammonds, Ill.

(To representative points)	Pres.	Prop.
Roselle, Ill.	55	40
Bartlett, Ill.	55	35
Davis Jct., Ill.	70	60
Rockford, Ill.	90	68

5159. **Rubble stone, carloads** (See Note 3), but not less than 40,000 lb., from **Lannon, Wis., to** Antioch, Ill. Present rate, 6c, Templeton, Wis., combination; proposed, 95c.

5164. **Silica,** carloads, from Murphysboro, Ill., to Dubuque, Ia. Rates in cents per net ton. Present, class rate; proposed, silica (crude), in bulk or sacks, minimum weight 40,000 lb., 320c.

5169. **Sand and gravel,** except blast, engine, foundry, glass, molding or silica, usual minimum weight, from Aurora, Ill., to Kankakee, Ill. Present rate, combination; proposed, 88c per net ton.

5172. **Sand and gravel,** carloads, from Muscatine, Ia., to various Illinois destinations. Rates in cents per net ton.

(To representative points)	Pres.	Prop.
C. & A. R. R. stations:		
Dwight, Ill.	*	136
Towanda, Ill.	*	136
C. B. & Q. R. R. stations:		
Iowa Junction, Ill.	*	123
Rockport, Ill.	*	149
Polo, Ill.	*	123
I. T. R. R. stations:		
Monroe, Ill.	*	149
Wyckles, Ill.	*	136

*Class "E."

5193. **Molding sand,** carloads (See Note 1), from Bowes, Ill., to various Illinois points. Rates in cents per net ton.

(To representative points)	Pres.	Prop.
Belleville, Ill.	*	214
Edwardsville, Ill.	*	189
Quincy, Ill.	*	214
Kewanee, Ill.	*	176
Freeport, Ill.	*	146

*Class rates.

5214. **Crushed stone,** carloads (See Note 2), from Joliet, Ill., to Reddick, Ill. Rates in cents per net ton. Present rate, 101c; proposed, 88c.

5217. **Sand and gravel,** carloads, from Chillicothe, Ill., to El Paso, Ill. Rates in cents per net ton. Present rate, 190c; proposed, 101c.

NEW ENGLAND FREIGHT ASSOCIATION DOCKET

17712. **Sand, blasting, core, fire and sea,** carloads (See Note 2), from Randolph, Mass., to Boston, Mass. Present rate, 10c per 100 lb.; proposed, 70c per net ton. Reason—To meet motor truck rate.

17713. **Stone, broken or crushed,** carloads, minimum weight. Present, 90% of the marked capacity of car furnished; proposed, 40,000 lb. per car, from Branford, Conn. (Pine Orchard Quarry) to Rosslyn, Va. Present rate, $4.40 per net ton; proposed, $7.60 per net ton. Reason—Cancellation of obsolete rate.

17722. To cancel commodity rate of $3.28 per net ton on **crushed stone,** from Bethel, Vt., to Rochester, Syracuse and Utica, N. Y., as named in C. V. Ry. Tariff I. C. C. A5798, and apply in lieu thereof rate of 30½c per 100 lb. Reason—Rate obsolete.

17769. **Sand, blasting, core, fire and sea** (See Note 2), from Fox Point, R. I., to Poughkeepsie, N. Y. Present rate, 21½; proposed, 14½c. Reason—To provide commodity rate on same basis as rates now in effect from and to other points.

17781. **Common sand** (See Note 3), from Westboro, N. H., to Newport, Vt. Present rate, $1.50 per net ton; proposed, 18½c. Reason—To grant shippers a commodity rate comparable with other commodity rates now published.

17794. **Sea sand** (See Note 2), from Gloucester, Mass., to Oak Street, Mass. Present rate, 18c; proposed, 10c. Reason—To grant shippers a commodity rate comparable with other commodity rates now published.

CENTRAL FREIGHT ASSOCIATION DOCKET

22559. To establish on **refuse limestone screenings,** carloads (See Note 1), except when car is loaded to full cubical or visible capacity actual weight to apply, from Hillsville, Penn., to Walford, Penn., rate of 40c per ton of 2000 lb. Present rate, 8½c (sixth class).

22560. To establish on **sand, blast, core, engine, fire or furnace, glass, grinding or polishing loam, molding or silica,** carloads, from Canton, O., group to Carpentersville, Ill., rate of 302c per net ton. Present rate, sixth class.

22569. To establish on **sand and gravel,** carloads, from Troy, O., to McMoran, O., rate of 90c per net ton. Present rate, sixth class.

22570. To establish on **crushed stone,** carloads, from Lima, O., to Richmond, Ind., rate of 105c per net ton. Present rate, sixth class rate of 15c.

22571. To establish on **crushed stone,** carloads, from Melvin, O., to Dabney, Ind., rate of 125c per net ton. Present rate, 138c per net ton.

22594. To establish on **crushed stone,** carloads, Greencastle and Limedale, Ind., to Bloomfield, Ind., via C. I. & L. Ry., Bloomington, Ind., and I. C. R. R., rate of 105c per net ton. Present rate, 113c per net ton.

22582. To cancel present rates on **sand and gravel** published in P. R. R. tariffs, Ohio No. F-1445 and I. C. C. No. 59, from Adams Mill, O., Bellaire, O., Canton, O., Crooksville, O., Junction City, O., Martins Ferry, O., Niles, O., Ravenna, O., Roseville, O., Salem, O., Strasburg, O., Trinway, O., and Warren, O.

22613. To establish on **sand** (other than blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) **or gravel,** carloads, Jamestown, N. Y., to Steamburg, N. Y., rate of 70c per net ton. Present rate, sixth class, 200c per net ton.

22628. To establish on **sand and gravel,** carloads, Phalanx, O., to Laughlin, O., rate of 110c per net ton. Present rate, 120c per net ton.

22653. To establish on **crushed stone** and **crushed stone screenings,** in bulk, in open cars (See Note 3), Kenneth, Ind., to Goldsmith and Kempton, Ind., via Nickel Plate road, rate of 95c per net ton. Present rate, 101c per net ton.

22674. To establish on **crushed stone,** carloads, from St. Paul, Ind., rates in cents per net ton.

To	Prop.	Pres.
Alert, Ind.	75	97
Elizabethtown, Ind.	80	97
Asalia, Ind.	80	....
Seymour, Ind.	85	....

22676. To establish on **crushed stone,** carloads, Greencastle, Ind., to East Chicago, Ind., E. J. & E. Ry. delivery, rate of 130c per net ton. Present rate, sixth class.

22677. To establish on **gravel and sand,** carloads, Massillon, O., to East Union, O., rate of 60c per net ton. Present rate, 70c per net ton.

22679. To establish on **crushed stone** and **crushed stone screenings,** carloads, from Blanchard, O., in cents per net ton: Proposed rates—To Coolville, O., 145c; Guysville, O., 135c; Jackson, O., 145c; Mineral, O., 135c; Torch Hill, 145c, on N. Y. C.-B. & O. route; Vinton, O., 135c, on N. Y. C.-H. V. route. Present, class rates.

22680. To establish on **sand and gravel,** carloads, Lorain, O., to Ashtabula, O., rate of 90c per net ton. Present rate, classification basis.

22681. To establish on **crushed stone,** in open cars, Marble Cliff and Sullivant, O., to Alexanders, Howenstein and Krumroy, O., rates of 135c, 115c and 125c per net ton. Present rates, classification basis.

TRUNK LINE ASSOCIATION DOCKET

21592. **Crushed stone,** carloads (See Note 2), from Hendlers, Penn., to Locust Gap, Penn., $1.40 per net ton, present rate $1.60 per net ton. Reason—Proposed rate is comparable with rates to Auburn, Schuylkill Haven and Connor, Penn.

21598. **Limestone, unburnt, ground or pulverized,** carloads, minimum weight 50,000 lb., from Thomasville, Penn., to Newark, O., 16c per 100 lb.; present rate, 20½c per 100 lb. Reason—Proposed rate compares favorably with rate from Thomasville, Penn., to Charleston and Huntington, W. Va.

21602. **Sand,** other than blast, engine, foundry, molding, glass, silica, quartz or silex, **also gravel,** carloads (See Note 2), from Wilmington, Del., Bacon Hill, North East, Charlestown and Principio, Md., to Millington, Md., 90c per net ton; present rate, $1.25 per net ton. Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

21603. **Crushed stone,** carloads (See Note 2), from Northampton, Penn., to Mt. Carmel, Penn., $1.50, and Middleport, Penn., $1.35 per net ton. Reason—Proposed rates are fairly comparable with rates from Bethlehem, Penn.

21351. **Ground limestone,** carloads, minimum weight 50,000 lb., from Union Bridge, Cavetown, Security, Salisbury, Pinesburg, Charlton, Md., and Pinola, Penn., to Bridgeton, N. J., 14½c per 100 lb.

21647. **Crushed stone,** carloads (See Note 2), from White Haven, Penn., to Saco, Penn., $1.25 per net ton. (Present rate, $1.60 per net ton.) Reason—Proposed rate is comparable with rate from White Haven, Penn., to Olyphant, Penn.

21648. **Crushed stone,** carloads (See Note 2), from White Haven, Penn., to Elmhurst, Penn., $1.15 per net ton. (Present rate, $1.25 per net ton.) Reason—Proposed rate is comparable with rates on like commodities for like distances, services and conditions.

21447. **Glass sand,** carloads (See Note 2), from Round Top, Md., to Ford City, Penn., $1.95 per net ton.

21655. **Trap rock, mine rock, broken stone and crushed stone,** carloads (See Note 2), from Jamesville, N. Y., to P. S. & N. R. R. stations. Perkinsville, Garwood, N. Y., Smethport, Clermont, Drummond, Pa., and various. Rates ranging from $1.70 to $2.20 per net ton. Reason—Proposed rates are based on the slag scale in I. C. C. Docket 15216.

WESTERN TRUNK LINE DOCKET

5759E. **Limestone, crushed or ground,** in mixed carloads with grain and grain products, from and to points in Western Trunk Line territory. Present—The rate on limestone, crushed or ground, actual weight, shall be the carload rate applicable to the highest rated grain or grain products in the car; the weight of the limestone, crushed or ground, to be applied toward the minimum weight prescribed for such mixed carload. Proposed—The rate on limestone, crushed or ground, actual weight, shall be the carload rate applicable to the highest rated grain or grain products in the car, the weight of the limestone, crushed or ground, to be applied towards the minimum weight prescribed for such mixed carload, except that the actual weight of the limestone, crushed or ground, shall not exceed 20% of the entire weight of the shipment.

7012. **Sand, silica, crude and processed,** carloads, from Ottawa, Ill., and points taking same rates, to Central Freight Association territory. Present rates—To Indiana, Michigan and Wisconsin, for distances up to 390 miles, as shown under I. C. C. Docket 17817, Sub. 1 scale. Proposed, rates to all of Official Classification territory, except as named above, and distances beyond 390 miles, as shown under I. C. C. Docket 17817, Sub. 1 scale.

Rates from Laramie

ACTING upon the request of the Monolith Portland Midwest Co., which has just recently begun operation of its new plant at Laramie, Wyo., the Wyoming Public Service commission has filed a petition for leave to intervene in a hearing of the interstate commerce commission at Kansas City on September 19, at which time counsel for the cement company will vigorously oppose any disturbance of freight rates on the grounds that any change would be detrimental to the marketing of their product.

The Iola Cement Mills Traffic association, a voluntary association of cement manufacturers of southeastern Kansas and Dewey, Okla., formed for the purpose of protecting the freight traffic of its members and the increase, progress and extension of their markets and to take concerted action in matters pertaining to their freight traffic, have filed a complaint with the interstate commerce commission, alleging that the rates from the Laramie cement mill, and also from cement mills in Colorado, to points of destination in the states of Wyoming and Colorado, at which points the Kansas and Oklahoma cement mills compete with the Laramie mill, are unjust and unreasonable, and that said rates unduly prefer the Laramie and Colorado cement mills to the serious disadvantage of the Kansas and Oklahoma mills.

The complainants pray that the interstate commerce commission, after a hearing, prescribe a just and reasonable and non-discriminatory relationship of rates for the transportation of cement from Laramie and from Kansas and Oklahoma origin points to the competing points of destination in Wyoming and Colorado.

The situation seems to be that the Laramie mill is now selling cement in a territory in which the Kansas and Oklahoma interests formerly enjoyed a monopoly, and that they are now coming before the interstate commerce commission, asking that rates which have been made by the railroads to enable the Laramie mill to market its product, be set aside to the end that the Kansas and Oklahoma interests may again enjoy such monopoly.—*Cheyenne* (Wyo.) *Tribune-Leader.*

I. C. C. Reports

No. 21958. Sub.-No. 1. Oklahoma Portland Cement Co. vs. Arkansas Western et al. Dismissal recommended. Claim for reparation on shipments of cement from Ada, Okla., to Waldron, Alma, Dyer, Ozark, Dardanelle, Fort Smith and Van Buren, Ark., barred by Rule III(s) of Rules of Practice.

No. 19635. Interstate Sand and Gravel Co. vs. Wabash et al. By division 2. Rates on sand and gravel, Kern, Ind., to various points on the Wabash in Illinois unreasonable and unduly prejudicial, to the extent that the rates from Kern exceeded or might exceed, in cents per net ton, 90 cents to Philo, 98 cents to Monticello and Lodge, 101 cents to Boody, Gibson City and Springfield and 105 cents to Morrisonville, rates prescribed to be maximum at intermediate points. New rates are to be established not later than October 14.

No. 21636. M. G. Winterburn, Inc., vs. S. A. L. et al. By division 5. Complaint dismissed. Rate on gravel, Montgomery, Ala., to Dickert and Falmouth, Fla., not unreasonable.

No. 21369. Texas Cement Plaster Co. vs. M. K. T. of Texas et al. By division 3. Rates on cement plaster, carloads, Plasterco Junction, Texas, to destinations in Florida, unreasonable and unduly prejudicial to the complainant and unduly preferential of competitors at Acme and Agatite, Texas, to the extent they exceeded those from Acme and Agatite to the same destinations. Reparation awarded. Complainant to file Rule V statements.

No. 21026. Carbon Limestone Co. vs. Pennsylvania et al. Attorney-Examiner George M Curtis. Dismissal proposed on finding rates on crushed stone, Hillsville, Penn., to destinations in New York, Pennsylvania and West Virginia not unreasonable or otherwise unlawful.

Belmont-Gurnee Co. Interests Reported Sold to New York Trap Rock Corporation

UNCONFIRMED reports state that the Belmont-Gurnee Crushed Stone Co., North Bergen, N. J., has changed hands in a deal involving over a million dollars. The sale is reported to have been consummated several weeks ago. These reports are current in local newspapers particularly the *Hoboken* (N. J.), *Observer* from which the following is taken.

"The George M. Brewster & Sons' Co., Bergen county contracting firm, purchased the absolute control of the company, but the understanding is that they did not buy for themselves, but in the interests of the New York Trap Rock Corp. which controls many eastern quarries.

"Athough the *Observer* got in touch with John L. McMahon, former county register and Democratic leader of North Bergen, who was president of the original company, he refused to discuss the sale.

"Rumors were current in the Granton section that the sale was made because William Dehm, secretary, treasurer and general manager of the firm, was brokenhearted over the explosion that caused the deaths of five men and much damage to property in that section recently. It was the first accident the company had, but it was learned that it had nothing to do with the sale.

"The other officer of the firm was James McMahon, brother of John, who was vice-president.

"The firm was founded by the three men about 25 years ago and developed rapidly. At present it has an output of 2,500 tons of crushed stone daily. Five quarries were controlled by the local group, the one in the Granton section, where the general offices were, and others in Alpine, Suffern, West Nyack and Mount Ivy, N. Y. The North Bergen quarry was started by the local men, but the others were acquired after they had been worked by others."

Canada Cement Co. Puts Bulk Cement Carrier in Service

CANADA CEMENT CO., LTD., recently put into operation a special self-unloading steamer for the transportation of cement in bulk between Montreal, Quebec, Halifax and St. John, N. B. The vessel was launched recently from the yards of the Furness Shipbuilding Co., Ltd., Harverton Hill-on-Tees and is called the *Bulkarier*. Its first cargo was of coal, part of which was discharged at Sorel before the trip was continued to Montreal. Under the new system developed for loading her with cement in bulk, it is expected that no more than 10 hours will be required to load the cargo, and only five hours to discharge it.

Particular interest is also attached to the modification in the Canada company's policy, rendered possible by the shipment of cement in bulk to the Maritime provinces for local distribution after being bagged at local plants in Quebec, Halifax or St. John. The storage and shipping facilities have already been completed at Quebec, those at Halifax should be in commission some time this autumn, while the plant at St. John should be completed early next year.

The *Bulkarier* is 258 ft. in length overall, 44 ft. beam, has a moulded depth of 25 ft. and is divided into three holds. Two tunnels, running parallel with the keel, are located beneath the holds for the transfer of cement to a loading hopper in the forward section of the ship. By opening a series of outlet traps in the roof of the tunnels, cement flows down and is drawn along towards the steamer's bow by two six-yard scrapers. It is then delivered to a conveyor belt that elevates the cement to deck level, where it is transferred to another conveyor belt that moves over a 90-ft. boom extending from ship to shore. The cement is delivered to a hopper on the dock, from which it is once more conveyed to the storage bins; the cement is then bagged as required, and carried by rail or truck to its destination in the vicinity.

Cement is loaded in Montreal by means of a Fuller-Kinyon pump that distributes it evenly over the whole ship. On returning to Montreal, however, cargoes of crude gypsum will be carried from the Maritime provinces, this being loaded through hatches in her deck.

The *Bulkarier* is propelled by triple expansion engines, of 900 hp., developing their power from oil-fired boilers. It has a speed in the vicinity of ten knots per hour. No plans have yet been announced by the Canada company for the duplication of this craft, and it is unlikely that anything will be done until the economic advantages of this vessel have been studied.

Approve Receiver's Sale of Hahn-Muscatine Gravel Co.

SALE OF physical assets of the defunct Hahn-Muscatine Gravel Co., Muscatine, Iowa, has been approved by Walter A. Newport, referee in bankruptcy to settle claims of about $109,000 against the company. Real estate and equipment are valued at $25,000. Bankruptcy proceedings were started a short time ago after two years' operation of the plant under a voluntary receivership had been unsuccessful, E. C. Graebner, receiver, reporting to the court that it would not be possible to effect a sale at a price anywhere near meeting debts of the concern. Two years' operation netted only $1,428.47 and all claims were in excess of $125,000, including $106,272 by trustees for bondholders under a first mortgage lien.

Dewey Portland to Make Water Shipments from Davenport Mill

THE Dewey Portland Cement Co. has announced plans for construction of a $200,000 river terminal and wharf at its plant near Buffalo, Iowa, and H. F. Tyler, vice-president and plant manager, stated that decision to proceed with the work this fall came after close study of factors in the situation had convinced company officials of the profitable use of water transportation for its products. The dock will be 400 ft. long and 24 ft. wide with accommodation for two of the largest barges now in use on the upper Mississippi river. The company expects to have monthly shipments of a bargeload when the river opens in the spring and will later increase this to a barge a week.

Sues for Unpaid Quarry Royalties

SUIT for unpaid royalties for rock quarries has been filed by Z. Besant against the Belanger Cement Works, Ltd., Canada. The plaintiff is seeking to recover on a based agreement with the cement company whereby the latter was to exploit property consisting of 67 lots in Rosemount. On each ton of rock taken from the ground, a royalty of 9 cents was to be paid. From April 11, 1927, until August 11, 1929, rock has been quarried. During that period it is contended that the royalty payments amounted to $7,722.

G. E. Pierson, Vice-President, Lone Star Cement Co. Indiana

G. E. PIERSON, recently elected vice president of the Lone Star Cement Co. Indiana (ROCK PRODUCTS, August 17, 1929), has been identified with the cement industry for 20 years. His first position in the industry was with the Monarch Portland Cement Co., Wichita, Kans., in the capacity of city salesman, a position he worked at from January, 1909, until December, 1912. Following this he became territory representative for the Western States Portland Cement Co.

In 1915 he was made assistant sales manager of the Western States company and in 1916 was given the position of sales manager, keeping that capacity until August 1924 at which time he resigned to accept a position with the International Cement Corp. with headquarters at Kansas City, Missouri. He remained there until August, 1926 at which time he was transferred to Indianapolis as sales manager of the Indiana Portland Cement Co., likewise a subsidiary of International. In July, 1928, he was made manager of the Indiana Portland and his election to the vice-presidency was made effective on July 21, 1929.

Senate Committee Report on Rock Products Tariffs

THE MAJORITY REPORT of the United States Senate finance committee on the proposed tariff bill contains the following paragraphs of interest to producers of rock products:

The committee has changed a number of the rates imposed under the bill passed by the House, of which 20 were increases and 30 were decreases. These changes include 3 commodities which have been transferred to the free list, and 3 commodities which have been transferred from the free list to the dutiable list. The items transferred to the free list are silica, burrstones, and grindstones. Those transferred from the free list are statuary of plaster of Paris for presentation (without charge), to religious organizations.

Additional protection was given to a number of industries which by reason of changed conditions—manufacturing or competitive—subsequent to the enactment of the existing law, have found it increasingly difficult to dispose of their products in the American markets in competition with the products of foreign producers. These include the brick, cement, tile, pottery, and glass industries, whose sales are largely affected by the competition in domestic markets from foreign sources.

Paragraph 205—Cement

Because of comparatively high transportation costs in this country, imported portland cement competes with the domestic product principally at American seaboard points, and the domestic cement plants most effected by the competition from foreign sources are those adjacent to the seaboard which ordinarily supply seaboard markets. Ninety per cent or more of the imports, for the most part from Belgium, are entered free of duty. The great bulk of the imports has been sold in a relatively few important markets on the Atlantic, Gulf, and Pacific coasts, and importation free of duty has enabled importers to undersell the domestic cement at these markets—in most instances considerably lower than the prices prevailing at points distant from the seaboard—indicate that the American producers have found it necessary to materially reduce their prices in order to dispose of their products in such markets. A duty of 8 cents per 100 pounds, which is equivalent to 30.4 cents per barrel, is imposed in order to more nearly equalize the spread between prices of competing domestic and foreign products.

Glass and Glassware

The rates of duty imposed upon common window glass and plate glass are, in effect, practically those proclaimed by the President in accordance with the findings of the Tariff Commission in its investigations of the differences in costs of production of comparable and competing domestics and foreign products.

Paragraph 1775—Silica

By the insertion of the word "silica" in paragraph 1775, entry free of duty is provided for the classes of silica subject to duty under the provisions of paragraph 207 of existing law, as well as for all other commodities, not specially provided for, commercially or commonly known as silica.

Schedules in Senate Bill

Par. 204. Crude magnesite, fifteen thirty-seconds of 1 cent per pound; caustic calcined magnesite, fifteen-sixteenths of 1 cent per pound; dead burned and grain magnesite, and periclase, not suitable for manufacture into oxychloride cements, twenty-three fortieths of 1 cent per pound.

Par. 205. (a) Plaster rock or gypsum, ground or calcined, $3 per ton.

(b) Roman, portland, and other hydraulic cement (unchanged).

(c) Keene's cement, and other cement of which gypsum is the component material of chief value: Valued at $14 per ton or less, $3.50 per ton; valued above $14 and not above $20 per ton, $5 per ton; valued above $20 and not above $40 per ton, $10 per ton; valued above $40 per ton, $14 per ton.

(d) Other cement, not specially provided for, 20 per centum ad valorem.

Par. 206. Pumice stone, unmanufactured, valued at $15 or less per ton, one-twentieth of 1 cent per pound; valued at more than $15 per ton, one-eighth of 1 cent per pound; wholly or partly manufactured, three-fourths of 1 cent per pound; manufacturers of pumice stone, or of which pumice stone is the component material of chief value, not specially provided for, 35 per centum ad valorem.

Par. 208. Mica, unmanufactured, valued at not above 15 cents per pound, 4 cents per pound; valued above 15 cents per pound, 2 cents per pound and 25 per centum ad valorem; mica, cut or trimmed, 35 per centum ad valorem; mica splittings, 25 per centum ad valorem; mica plates, and built-up mica, and all manufacturers of mica or of which mica is the component material of chief value, by whatever name known, and to whatever use applied, and whether or not named, described, or provided for elsewhere in this act, 40 per centum ad valorem; waste, scrap, and ground mica, 5 per centum ad valorem.

Par. 209. Talc, steatite or soapstone, and French chalk, crude and unground, one-fourth of 1 cent per pound; ground, washed, powdered, or pulverized (except toilet preparations), 25 per centum ad valorem; cut or sawed, or in blanks, crayons, cubes, disks, or other forms, 1 cent per pound; manufacturs (except toilet preparations), of which talc, steatite or soapstone, or French chalk is the component material of chief value, wholly or partly finished, and not specially provided for, if not decorated, 35 per centum ad valorem; if decorated, 45 per centum ad valorem.

France Stone Buys Urschel Lime and Stone Co.

ACCORDING to recent announcement, the France Stone Co., Toledo, Ohio, has purchased the assets of the William L. Urschel Lime and Stone Co., also of Toledo operating a crushed stone and lime plant at Gibsonburg, Ohio. The purchase was made from the estate and heirs of the founder of the company who died in June, 1928, and while no consideration was announced, it is understood that the deal involved more than $1,000,000.

With the acquisition of the Urschel company, the France company becomes a producer of lime for the first time in its history althought it operates many quarries and crushing plants in Ohio, Indiana and Michigan. Officials of the France Stone Co. said that the Urschel company policies and operations would not be changed much at the present time, but that improvements would be made and the business continued on a larger scale.

The Urschel company was founded by the late William L. Urschel who was connected with the lime industry for more than 25 years. He founded the present company in 1924 with a capital of $800,000. The plant which he built at Gibsonburg has a capacity of more than 350 tons of hydrated lime and 2000 tons of crushed stone a day. For a number of years Mr. Urschel was associated with his brother, J. J. Urschel, in the Woodville Lime Products Co., but in 1927 disposed of his interests in that company to his brother.

The negotiations for the purchase of the Urschel interests were conducted by the France officials directly with Mrs. Elizabeth Urschel, widow of the late Wm. L. Urschel, officers of the company, and the Toledo Trust Co., which acted as a trustee under the will. Officers of the William L. Urschel Lime and Stone Co., who have been serving since the death of the head of firm, include J. R. Morris, president; Gordon Mather, vice-president, and C. J. Flynn, secretary-treasurer.

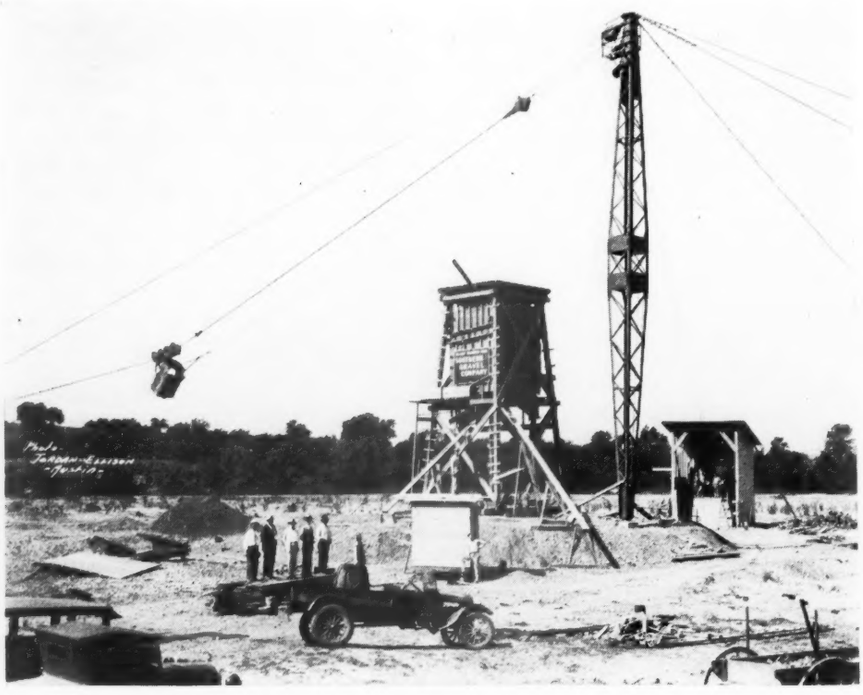
George A. France is president of the France Stone Co.; H. E. Bair and H. M. Sharp, vice presidents, and W. G. Scheub, secretary. The company has its headquarters in the Second National building, Toledo. It operates about 35 large quarries and plants scattered well throughout Ohio, Indiana and Michigan, and holds large reserves of undeveloped stone lands.

Batesville Gravel Company Sold

J. H. BUCK has purchased the Batesville Sand and Gravel Co., Batesville, Ark., from Roy Hudson and W. M. Searcy, who will continue to operate the plant for Mr. Buck. The new owner is a prominent local road contractor.—*Batesville* (Ark.) *Guard.*

Southern Gravel of Texas Completes New Plant

THE RECENTLY completed plant of the Southern Gravel Co., Austin, Texas, is now on regular production. Excavation of bank material is by means of a Street Bros. slackline cableway system using a 2 cu. yd. bucket equipped with hood to increase capacity. A 2-speed electric hoist driven by a 175 hp. General Electric Co. motor operates the slackline.



Southern Gravel Co.'s new plant at Austin, Tex.

The steel mast of Street Bros. design and manufacture is 75 ft. high. The track sheaves and all the blocks are of roller bearing type and the outer tension block has a ball-bearing swivel.

Lime for Construction, 1928

A PARTIAL summation of statistical data in hand has been made by the U. S. Bureau of Mines. There data show that in New England and seaboard states, south to and including Virginia, a total of approximately 620,000 short tons of lime was made and sold by producers in 1928 for use in building and other construction purposes.

The final tabulation from all the states will soon be released.

Clearwater Lime Products Now in Operation

CLEARWATER Lime Products Co.'s new crushing plant at Orofino, Idaho, has been fully completed and is now running on a full shift basis. Between 15 and 20 tons of ground limestone are being shipped for agricultural uses, chicken grits, etc., as well as a fair quantity of rock for the paper mills.

The company recently purchased a new Gardner two-drill air compressor and a new Gilman air drill of the latest type which are now being used in driving the tunnel.

At present excavation work is being done for the erection of two lime kilns of 25 tons daily capacity. The order for these was placed recently and they are expected to arrive shortly from York, Penn. After the kilns are installed and going which will be some time in October, a hydrator will be added, located between the two kilns. Following this warehouses for the burned lime will be constructed to hold surplus stocks for shipment orders.—*Orofino* (Ida.) *Tribune.*

1,000,000 Tons of Rock for Palestine Breakwater

IT IS announced that preliminary operations on the harbor extension works at Haifa (Palestine) have begun. Haifa, with Jaffa, deals with almost all the oversea trade of Palestine, and the scheme will take three years to complete.

One million tons of rock will be required for the construction of breakwaters. Quarries for the stone are to be opened up in the Mount Carmel Range, about eleven miles south of Haifa. Near the entrance of the harbor an area is to be deepened and moorings provided to enable a 30,000 ton liner to enter the harbor. A deep-water berth, 1100 ft. long, is to be made to accommodate two or three steamers, and a quay 950 ft. long will be built for lighters. At present steamers usually anchor about half a mile from the shore and lighters are employed for the transport of passengers and cargo to and from the jetty. Wendell, Paler and Tritten have designed the proposed works.

Certain-teed Operating Texas Plaster Mills to Capacity

THE Certain-teed Products Corp. is now operating its gypsum plaster and wallboard mills at Acme and Agatite, Tex., to capacity, with a daily production of approximately 1500 tons. The mill at Agatite was closed down two years ago, immediately after its purchase by the Certain-teed Products Corp. from the Beaver Products Corp., and its reopening was delayed because of improvements which were made to the plant. The wallboard production will be still further increased, and the construction of an additional mill is under consideration. The company owns large gypsum rock deposits here and although the mills have been in operation for many years, the available supply of material has barely been touched.

Port Stockton Cement Granted Stock Selling Permit

DETAILS of how the Port Stockton Cement Co., Port Stockton, Calif., will expend money derived from the sale of its stock are contained in announcements recently from the company. The corporation commissioner, in granting the stock selling permit, ordains that the money must be used for the following specific purposes:

1. Erection of a mill in Stockton costing $1,750,000. Acquisition of a site from the City of Stockton at a cost of $100,000.

2. Purchase of a clay deposit of ninety acres between Burns cut-off, on the San Joaquin river, the Santa Fe Railroad and the Dagget road, at a cost of $50,000.

3. Construction of six miles of railroad as a branch of the Sierra Railroad from Jeffersonville to the crushing plant at the quarry at Columbia at a cost of about $100,000.

4. Erection of quarry machinery and development of the 800-acre limestone deposit now owned by the concern at Columbia, Tuolumne county, at an estimated cost of $400,000.

Engineers of the company are now working on the detailed plans for various units of the concern with a view of getting into the construction stage within a short time. —*Stockton* (Calif.) *Record.*

The Port Stockton Cement Co. was recently organized and plans the erection of a 4,000 bbl. per day cement mill at Port Stockton (see ROCK PRODUCTS, August 3, p. 113 for details)—Editor's Note.

Oklahoma Cement Prices Cut

A PRICE cut of 13 to 20 cents a barrel on portland cement was announced by Chauncey Nichols, manager of the Oklahoma Portland Cement Co., recently.

Prices quoted to state and commercial consumers now will be $2.66 a barrel with 10 cents a barrel trade and cash discount. The cut is part of a general reduction by the Oklahoma company, Mr. Nichols said, and through this reduction it is hoped that a general road construction program will be stimulated.—*Oklahoma City* (Okla.) *News.*

Mobile Company Makes Large Improvements to Facilities

IMPROVEMENTS costing in excess of $150,000 have been made during the past 12 months to the plant of the Mobile and Gulf Navigation Co., Mobile, Ala., according to R. Herndon Radcliffe, president of the company. During the year the company's payroll has been increased to $65,000.

Included in the additions is a gantry crane, which has a capacity of 2500 tons of sand and gravel daily. This apparatus costing about $50,000 handles sand and gravel from barge to bin, freight cars or the ready-mixed concrete plant, which was installed five months ago at a cost of $25,000.

The ready-mixed concrete plant, also modern in every detail, was installed on property of the company, and according to President Radcliff installation was justified by the paving of streets and sidewalks in the city. The concrete is mixed and hauled in trucks to different sections of the city where it is used.

New docks, costing $65,000, were erected last year, and concrete bins were completed also during the year.

Sand and gravel pits are operated by the company on the Alabama and Tombigbee rivers. Considerable material is taken from rivers and streams of this section with permission of the United States government.

The firm operates 30 barges, five towboats and four dredges. It owns 600 ft. of water front property and has sidetracks running along the river.—*Mobile* (Ala.) *Register.*

Dealer View of Cement Price Cuts

A DEALER point of view of the recent cut in portland cement prices of from 20 to 30c. per bbl. is given in *Building Supply News* (Chicago) as follows:

"Announcement by leading cement producers of a 20 to 30c. per bbl. cut in mill prices caused considerable perplexity among metropolitan (New York) dealers, many of whom were carrying relatively heavy warehouse stocks at the time.

"As a rule, the daily newspapers do not pay very much attention to the movement of building material prices, but in this case, with cement to the front in the proposed tariff legislation, the price cut came in for generous publicity. As a result, contractor-customers immediately clamored for lower prices on cement out of dealers' warehouses, conveniently overlooking its higher cost to the latter. This called for a lot of explaining, but dealers generally decided to stand pat on their old retail prices, and most of them will continue to do so until their stocks have been worked lower than they are at present.

Trade Discount Abolished

"With the carload price at once automatically lowered by the going into effect of the new mill prices, the market's undertone is none too steady. The cause of the price reduction is attributed to keener than keen competition among a number of the cement producers. One company which has steadfastly extended every possible protection to the dealer and which has always turned down all overtures for direct selling, has abolished the trade discount, giving to the dealer its unimpaired benefit, but instead of in the form of a differential, in a corresponding reduction in the flat per barrel price. In explanation, its sales manager said to *Building Supply News'* eastern editor:

"'We felt that the trade discount was being made the football of competition, and we decided that the best way to serve our many dealer-friends was to do away with all misleading trade discounts, sell them cement at the lowest market price, and, just as merchants in other lines are wont to do, let them add whatever overhead and profit they see fit to do. We have always hewn strictly to the policy of 100% Dealer Distribution, and there will be not the slightest deviation from this rule in future.'

"It will be seen from the foregoing that this company has not, as some trade alarmists had it for a day or two, 'abolished the differential' in the sense that it deprived the dealer of anything in the way of profit or protection. It has met the price cut of other producers and is selling on a parity with their prices. It has simply abolished the custom of a trade discount, believing that it will be for the best interests of the cement industry and of dealers to do so. Whether other cement producers will follow suit, remains to be seen.

Dealers Hope for Uniformity

"Representative dealers who were asked for an expression of their views regarding this change in trade customs, said what the dealer was principally interested in was that he would not have to compete against direct selling and price-cutters. They admitted that there was no difference between a man sacrificing part of his differential and one who added an inadequate mark-up to flat costs. All expressed, however, the hope that uniformity would come to prevail in the end."

Cumberland River Sand Co. Buys New Dredging Plant

A COMPLETE new sand and gravel dredging plant, representing an investment of over $250,000, has been purchased by the Cumberland River Sand Co., Nashville, Tenn., from the Dravo Contracting Co., Pittsburgh, Penn. The fleet comprises a steel hull, stern-wheel type Diesel-engined towboat named the *Marjorie,* of 120 hp.; the hull is 74 ft. long, 16 ft. wide and 4 ft. deep. The steel hull ladder type dredge, named the *Cumberland,* has a dredging capacity of 225 tons per hour of marketable products.

This dredge is 120 ft. long, 32 ft. wide and 6 ft. deep. The fleet also includes six flush deck type, with steel cargo box sand and gravel barges, each 120x24x6 ft. The barges are now under construction and will be delivered within a short time.

The Cumberland company is a new concern incorporated under the laws of Tennessee and will operate on the Cumberland river in the Nashville district. The officers are: Capt. J. H. Duffy, president; J. M. Settle, vice-president; J. T. Duffy, secretary, and Charles H. Bohmer, treasurer, all of Louisville, Ky.—*Pittsburgh* (Penn.) *Post-Gazette.*

Beg Your Pardon!

THE EDITOR—We beg to call your attention to several misstatements made on p. 117 of ROCK PRODUCTS, June 8, 1929, concerning one of our *Explosives Service Bulletins.*

Under the head of "Combination Loads for Blast Holes" you give an abstract of our *Explosives Service Bulletin* for December, 1928, and your third paragraph reads as follows:

"Apparently an old practice still survives where a stick of dynamite is placed in a hole, followed by a charge of pellet powder. The powder is exploded by a squib and fuse, and the dynamite by the heat from the powder's detonation. The bulletin points out that owing to the great differences in the rates of detonation of dynamites and pellet powder that either the dynamite breaks down the material by itself, etc."

It is incorrect to state that the powder is exploded by a squib *and* fuse inasmuch as the two could not be used in conjunction. Either a miners' squib *or* safety fuse would be used.

It is also incorrect to speak of the detonation of blasting powder or pellet powder, and of the rate of detonation of pellet powder, inasmuch as blasting powder and pellet powder are deflagrating explosives. One speaks of the rate of detonation of dynamite and the burning speed of pellet powder.

ARTHUR LA MOTTE,
Manager, Technical Section, Explosives Department, Du Pont de Nemours and Co.
Wilmington, Del.,

Moline Consumers Opens New Gravel Plant at Reading, Mo.

ORGANIZATION of the Missouri Gravel Co. as a subsidiary of the Moline Consumers Co., Moline, Ill., is announced in the *Moline* (Ill.) *Times*. The new company is operating the recently completed gravel plant at Reading, Mo., built at a cost of $85,000. The concern is now handling about 20 carloads of products and it is expected that shortly from 30 to 35 cars per day will be handled. It is now under contract for supplying the material for the road building activities of the Missouri state highway commission which has just launched a $75,000,000 paving program.

The Moline Consumers' Co. now operates four large gravel-producing plants, one at Moline, one at Ottawa, one at LaGrange, Mo., and the latest one at Reading, Mo. Plans are now under way for a large new plant at LaGrange, Mo., located three miles from the original plant of the company at that city, which is now busy filling orders for ballast under a three-year contract with the C., B. & Q. railroad to be used in eastern Missouri and on the Galesburg-Quincy division.

C. B. Harvey, veteran employe of the Moline Consumer's Co., who has been superintendent of the LaGrange plant, has been appointed manager of the new Reading plant. Fred Lohmeier of Moline has been named superintendent at LaGrange. John Fierke, formerly a member of the Missouri state highway commission, is in charge of all Missouri operations.

Mining Fuller's Earth in Alabama

FULLER'S EARTH declared to be of high quality is being mined by the Choctaw Clay Corp., New Orleans, from deposits in Choctow county, Alabama. The plant is located a few miles from Meridian, Miss., on a tract of 437 acres on the Tennessee, Alabama and Northern railway. Thirty acres of the property, thus far prospected, are said to carry 1,000,000 tons or more of fuller's earth. Officers of the corporation include R. J. Wilkinson, president; W. H. Lindsey, Nashville, Tenn., vice-president; J. G. Miller, vice-president and manager, and L. M. Dalgarn, secretary-treasurer.

Cebu Portland May Get Large Government Cement Contract

THE purchase by the insular government of all its cement needs for the next five years from the Cebu Portland Cement Co., government-owned enterprise, which would involve a contract valued at more than P5,500,000, is being negotiated by officials of the cement firm with the bureau of supply.

The signing of a contract between the bureau of supply and the cement company is considered certain in view of the ruling of the council of state sometime ago that the government should buy from the government cement firm provided its prices are reasonable and not above market prices.

The insular government has an existing contract with the Cebu Portland Cement Co. for the supply of approximately 160,000 bbl. at current market price for its building requirements during the present year. This contract involves an expenditure of approximately P1,000,000.

The bureau of public works, however, is rapidly increasing its cement consumption due to the increase in the construction of public improvements both for insular and local projects.

Next year the government expects to use not less than 200,000 bbl. for pending projects so that at the price the government cement firm sells (price withheld, being confidential), the bureau of supply would spend approximately P1,300,000. With the gradual increase in the cement consumption of the government, the proposed contract with the cement company would cost somewhere near P6,000,000, in the opinion of supply officials.

The only question now for the signing of contracts papers appears to lie on whether the cement firm should increase its price by 15 cents a barrel as proposed by Alberto Barretto, manager of the cement company. This is opposed by Francisco Segado, insular purchasing agent, as unwarranted.

Mr. Segado said that the cement firm should, on the contrary, lower its price due to the fact that the company's sales would be assured for at least so many years. He also indicated that the "Apo" cement, which is the trade name for the local product, while as good as outside cement, may still be undersold by the Japanese imported product known commercially as "Asano."

The insular purchasing agent also declared that the cement company officials should not think that because they are making profit in the operation of the company, the prices could be indiscriminately raised without its sales being affected. The buoyant financial condition of the cement firm is due, he believes, to the fact that it is patronized by the government and that in dealing with the government it must show consideration in the matter of prices.

Officials of the public works department are believed in favor of the five-year contract and of a reasonable raise in prices provided such prices still could be considered reasonable and not above current market prices.

The Cebu Portland won a measure in its favor last year when the legislature passed a law requiring all imported cement to come within the government standard requirements. The measure was urged by officials of the local cement factory for the protection of the local industry.—*Manila* (P. I.) *Bulletin.*

Opportunity for Investment of American Capital in Foreign Cement Plant

THROUGH OFFICIAL sources the Department of Commerce has been informed that a certain East African government is actively interested in the establishment of a cement plant to be constructed and operated as a quasi-private enterprise. American capital is solicited in the furtherance of this project. Details will be furnished by the Minerals Division, Bureau of Foreign and Domestic Commerce on direct request of firms competent to negotiate along the lines indicated. (Ref. C. R. 315138.)

Several Cement Companies Planning Toledo Warehouses

TESTS now are being made on the Toledo, Ohio, waterfront near Locust street for the construction of a new dock and warehouse to be built by the Huron Portland Cement Co. of Wyandotte, Mich. The cement company will have 168 ft. of waterfront property adjoining the Kuhlman docks for a cement elevator and warehouse.

Another cement warehouse and additional docks may be built in the same vicinity by the Peerless Egyptian Cement Co. of Detroit, Mich., to be shared by the Bessemer Limestone and Cement Co. of Youngstown, Ohio. Plans for such a warehouse and dock now are being studied by the two concerns. —*Toledo* (Ohio) *Bee.*

Bellefonte Company Opens Underground Cavern to Visitors

THE BELLEFONTE Lime Co. is making a wider opening to the underground cavern discovered at its Salona, Penn., quarries several years ago.

When the opening is complete visitors will be permitted to view the cave on Sundays, the blasting operations at the quarries being suspended on this day.

The cave, apparently cut by an underground stream many years ago, consists of a large chamber, about 20 ft. high, and various rooms branching off. It contains rock formations of considerable interest, stalactites and stalagmites.

It was discovered two or three years ago when drills used in the quarries bored through into the chamber.

Due to the danger from the shooting and blasting which is in progress at the quarry throughout the week, the cavern will not be available to visitors except on Sunday.

The enlarging of the cave mouth will aid in getting rid of surplus water from the quarries. In dry weather, however, the cave is also dry and can be explored by following the bed of the vanished stream.—*Lock Haven* (Penn.) *Express.*

Insurance Report on Stone Mountain Compressed-Air Tank Explosion

IN ROCK PRODUCTS, March 16, 1929, Walter B. Lenhart, associate editor, described an explosion of a compressed air tank or receiver at the quarry of the Stone Mountain Granite Co., Decatur, Ga., on February 28, which caused the deaths of 7 men and injuries to 10 others. His description was based on a personal inspection immediately following the explosion. His observations on the cause of the explosion have been widely read and commented on.

Being unable to obtain any data from the men at the quarry his description of the tank or receiver was based on inspection of what remained of it after the explosion. It was slightly inaccurate as to lengths and diameter so we quote herewith from a recent issue of *The Locomotive*, a quarterly publication of the Hartford Steam-Boiler Inspection and Insurance Co., a more accurate description:

"Air for the pneumatic tools at the various workings in the quarry was supplied by a compressor located in a central power house from which pipes led to perhaps a dozen receiving tanks placed at strategic points throughout the quarry. The tank that let go was one of these storage vessels. It was 66 in. in diameter, 16 ft. long, and was made from the shell of a horizontal tubular boiler. The shell was 7/8 in. thick and had a double-riveted continuous lap seam. Just how long the vessel was used as a boiler is not known, but fifteen years ago the tube sheets and tubes were taken out and bumped heads substituted. From that time on the tank was in almost daily use under air pressure of about 90 lb.

"Five-sixteenths-inch plate was used for the heads, which had an extremely shallow bump and a short radius at the turn of the flange.

"On the morning of the accident a short crack appeared at the knuckle of a head flange. Pressure was taken off immediately and the repair gang set to work welding the crack. After a test for tightness pressure was again turned on and the tank lasted throughout the afternoon without showing signs of leakage. The quitting whistle had sounded and workmen were 'punching out' on a time clock in the shanty when the tragic accident occurred.

"An examination of the head revealed that, with the exception of the place where the welding was applied, the flange showed no evidence of the existence of an old crack. From all appearances the metal gave way simultaneously around the entire circumference of the head. Apparently lack of sufficient thickness and depth in the bumped head allowed bending at the flange as the head 'breathed' in and out with the variations in pressure. Eventually this flexing weakened the flange to the point where it gave way."

National Portland Plant Said to Be Under Construction

SEVERAL newspaper reports state that the construction of a $200,000 plant for the production of white portland cement is under way at Chabbuck, on the Phoenix extension of the Santa Fe railroad between Cadiz, San Bernardino county, and Parker, Ariz.

With 75 men employed in the work, the first unit of the mill is being erected and will be completed by September 15. The first unit, which will cost approximately $70,000 and will have a capacity of 150 bbl. a day, will give employment to about 100 men, according to accounts.

The erection of the remainder of the plant will be started immediately after the first unit is completed. The finished plant will have a capacity of 750 bbl. of cement a day and will give employment to about 200 men, according to the reports.

The project is being undertaken by the National Portland Cement Co. of El Paso.

Blue Ridge Talc Expanding

THE EXPANSION program under way at the Henry, Va. plant of the Blue Ridge Talc Co. is expected to give a 20% increase in the mortar color department. A Raymond high speed pulverizer, four steel hoppers, an additional bucket elevator and screw conveyor extensions have been installed in the grinding room. No changes have been made at the talc and soapstone mill although these departments have been working fully one-third beyond normal capacity for a good part of the year. In addition, a crude ore storage area of 2,500 sq. ft. has been created; this has retaining walls of concrete, 7 ft. in height.

Shipments are running about 30% above last year, C. O. Kitson, secretary-treasurer of the company, states.

Atlas Portland Gets Big Cement Order from Louisiana

REGARDING the placing of an order for two and one-half year's cement requirements of Louisiana's highway department, John R. Morron, president of the Atlas Cement Co., said:

"Atlas Portland Cement Co. offered its bid on 500,000 bbl. Its bid was accepted and the balance of the order was divided among three or four other companies."

A previous announcement that the International Cement Corp. had secured the order for the state's requirements for two and one-half years was premature and in error, says a New York dispatch.—*Chicago* (Ill.) *News*.

A Big High Alumina Cement Order

AN ORDER for cement, amounting to about $750,000 has just been placed by the Halifax (Nova Scotia) Harbour Commission with the Lafarge Aluminous Cement Co., Ltd. The cement will be used for the construction of a large pier at the Ocean Terminals in Halifax, N.S., and operations are to be commenced immediately by A. G. Tapley, chief engineer to the commission.

Last year the port of Halifax was unable to cope with the tonnage during the winter season, when the St. Lawrence River is closed, and the commission decided at once to take steps to deal with vessels desiring to make Halifax their port of discharge. The cement ordered is "Ciment Fondu" made at the Lafarge company's works at West Thurrock, Essex, Great Britain. It is reputed to be impervious to the corrosive action of seawater and will enable the new pier to be constructed within the shortest possible time.

Low Bids for Road Materials

BIDS on the first three projects of the Medina county, Ohio, 1929 secondary road program, opened recently by the county commissioners, disclosed a slashing of material prices. On the 20.55 miles of secondary road, estimated to cost $68,752, the three low bids call for an expenditure by the county of only $54,031.

These bids are for slag as the paving material. The low bids were given by three of the 11 contractors who offered to do the jobs. Contractors offering limestone bid a total of $62,306 for the three projects.—*Medina* (Ohio) *Gazette*.

Recent Contract Prices

Galesburg, Ill. T. O. Miles of Galesburg was the successful bidder for providing and spreading the gravel on a three-mile strip, west of Oneida, on a bid of $1.87 a ton. About 7000 tons will be required.

For furnishing and spreading the 3600 tons, approximately, for graveling one and one-half miles of road south of Altona, the Galesburg Sand & Gravel Co. was the low bidder, at $1.60 a ton.

The Coogan Gravel Co. of Peoria won the contract for graveling one mile of road east of Rio, requiring approximately 2300 tons, with a bid of $1.68.

One and one-half miles of road west of Henderson, requiring about 3800 tons, will be surfaced by the Galesburg Sand & Gravel Co. at the rate of $1.65 a ton.

Union Beach, N. J. City purchased 500 cu. yd. of gravel at $1.25 per cu. yd.

Cottage Grove, Ore. County agent offering agricultural limestone at $6.60 per ton f.o.b. Cottage Grove.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F.O.B., at producing point or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.	1.30	1.30	1.30	1.30	1.30	1.30
Bound Brook, N. J.	1.35	2.10	1.90	1.50	1.50	.....
Chaumont, N. Y.	.50	1.75	1.75	1.50	1.50	1.50
Chazy, N. Y.	.75	1.75	1.60	1.30	1.30	1.30
Dundas, Ont.	.53	1.05	1.05	.90	.90	.90
Farmington, Conn.	.....	1.30	1.10	1.00	1.00	.....
Frederick, Md.	.50– .75	1.35–1.45	1.15–1.25	1.10–1.20	1.05–1.15	1.05–1.10
Ft. Spring, W. Va.	.35	1.25	1.25	1.20	1.15	1.00
Munns, N. Y.	.75	1.00	1.00	1.00	.....	.....
Prospect, N. Y.	.80	1.00	1.00	1.15u	1.15u	.....
Rochester, N. Y.—Dolomite	1.50	1.50	1.50	1.50	1.50	1.50
St. Vincent de Paul, Que. (n)	.65	1.25	1.05	.95	.85	1.00
Shaw's Junction, Penn. (e)	.85	1.35–1.60	1.35	1.35	1.35	1.35
Syracuse, N. Y.	.50	1.00	1.00	1.00	1.00	1.00
Watertown, N. Y.	1.00	1.75	1.75	1.50	1.50	1.50
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL:						
Afton, Mich.	.....	.....	.....	.50	.....	1.50
Alton, Ill.	1.85	.....	1.85	.....	.....	.....
Cape Girardeau, Mo.	1.00	1.10	1.25	1.25	1.00	.....
Columbia and Krause, Ill.	1.05–1.40	.95–1.50	1.15–1.50	1.05–1.50	1.05–1.50	.....
Cypress, Ill.	1.60	1.00	1.10	1.00	1.00	1.25
Davenport, Iowa (f)	1.00	1.50	1.50	1.30	1.30	1.40
Dubuque, Iowa	.95	1.10	1.20	1.10	1.10	1.10
Stolle and Falling Springs, Ill.	1.05–1.70	.95–1.70	1.15–1.70	1.05 1.70	1.05–1.70	.....
Greencastle, Ind.	1.25	1.10	1.00	1.00	1.00	1.00
Lannon, Wis.	1.00	1.00	1.00	.90	.90	.90
McCook, Ill.	1.00	1.25	1.25	1.25	1.25	1.25
Marblehead, Ohio (l)	.55	.80	.80	.80	.80	.80
Northern Ohio points	.85–1.15	1.25	1.15	1.15	1.15	1.15
Sheboygan, Wis.	1.10	1.10	1.10	1.10	1.10	.....
Stone City, Iowa	.75	.....	1.10	1.00	1.00	.....
Thornton, Ill.	.90	1.00	1.25	1.25	1.25	1.25
Toledo, Ohio	1.10	1.70	1.70	1.70	1.70	1.70
Toronto, Canada	2.50	2.50	2.50	2.50	2.50	2.50
Valmeyer, Ill. (fluxing limestone)	.90–1.20	.....	.....	1.75	.....	1.75
Waukesha, Wis.	.90	.....	.90	.90	.90	.90
Winona, Minn.	1.00	1.20	1.30	1.40	1.40	1.40
Wisconsin points	.50	.....	1.00	.90	.90	.....
Youngstown, Ohio	1.00	1.00	1.25	1.25	1.25	1.25
SOUTHERN:						
Cartersville, Ga.	1.00	1.65	1.65	1.35	1.15	1.15
Chico, Texas	1.00	1.30	1.30	1.25	1.20	.....
Cutler, Fla.	.....	.50– .75r	.....	1.50–1.75r	.....	1.10r
El Paso, Texas (r)	.75–1.00	1.00–1.25	1.00–1.25	1.00	1.00	1.00
Graystone, Ala.			Crusher run, screened, $1 per ton			
Olive Hill, Ky.	.90	1.00	1.00	.90	.90	.90
Rocky Point, Va.	.50– .75	1.40–1.60	1.30–1.40	1.15–1.25	1.10–1.20	1.00–1.05
WESTERN:						
Atchison, Kan.	.50	1.80	1.80	1.80	1.80	1.70
Blue Springs and Wymore, Neb. (t)	.25	1.45	1.45	1.35c	1.25d	1.20
Cape Girardeau, Mo.	1.00	1.25	1.25	1.25	1.00	.....
Rock Hill, St. Louis, Mo.	1.45	1.45	1.45	1.45	1.45	1.45

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Birdsboro, Penn. (q)	1.20	1.60	1.45	1.35	.....	1.30
Branford, Conn.	.80	1.70	1.45	1.20	1.05	.....
Chico, Texas	2.50	2.25	1.55	1.25	1.10	.....
Eastern Maryland	1.00	1.60	1.60	1.50	1.35	1.35
Eastern Massachusetts	.85	1.75	1.75	1.25	1.25	1.25
Eastern New York	.75	1.25	1.25	1.25	1.25	1.25
Eastern Pennsylvania	1.10	1.70	1.60	1.50	1.35	1.35
Knippa, Texas	2.50	2.00	1.55	1.25	1.25	1.25
New Britain, Plainville, Rocky Hill, Wallingford, Meriden, Mt. Carmel, Conn.	.80	1.70	1.45	1.20	1.05	.....
Northern New Jersey	1.35–1.40	2.10	1.80–1.90	1.40–1.50	1.40–1.50	.....
Richmond, Calif.	.75	.....	1.00	1.00	1.00	.....
Spring Valley, Calif.	.90–1.25	.90–1.25	.90–1.25	.90–1.25	.90–1.25	.90–1.25
Springfield, N. J.	1.40	2.00	1.90	1.60	1.60	.....
Toronto, Canada	.....	5.80	4.05	4.05	.....	.....
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Berlin, Utley, Montello and Red Granite, Wis.—Granite	1.80	1.70	1.50	1.40	1.40	.....
Cayce, S. C.—Granite	.....	.....	1.75	1.75	1.60	.....
Eastern Pennsylvania—Sandstone	1.35	1.70	1.65	1.40	1.40	1.40
Eastern Pennsylvania—Quartzite	1.20	1.35	1.25	1.20	1.20	1.20
Emathla, Fla.—Flint rock	.....	.....	2.25–2.50s	.....	.....	.....
Lithonia, Ga.—Granite	.60	2.00b	1.75	1.35	1.25	.....
Lohrville, Wis.—Granite	1.65	1.70	1.65	1.45	1.50	.....
Middlebrook, Mo.	3.00–3.50	.....	2.00–2.25	2.00–2.25	.....	1.25–3.00
Richmond, Calif.—Quartzite	.75	.....	1.00	1.00	1.00	.....
Somerset, Penn. (sand-rock)			1.50 to 1.85			
Toccoa, Ga.—Granite	1.50	.....	1.50	1.35	1.30	1.25

(a) Sand. (b) to ⅛ in. (c) 1 in., 1.40. (d) 2 in., 1.30. (e) Price net after 10c cash discount deducted. (f) High calcite fluxing limestone, 92–98% CaCO, 1.75. (g) Run of quarry. (h) Less 10c discount. (j) Less 10% net ton. (k) Rubble stone. (l) Less .05. (n) Ballast R. R., .90; run of crusher, 1.00. (p) Carload prices. (q) Crusher run, 1.40; ¼-in. granolithic finish, 3.00. (r) Cubic yard. (s) 1-in. and less, per cubic yard. (t) Rip rap, 1.20–1.40 per ton. (u) Less 2%.

Agricultural Limestone

(Pulverized)

Alton, Ill.—Analysis, 99% $CaCO_3$; .03% $MgCO_3$; 90% thru 100 mesh	5.00
Bettendorf and Moline, Ill.—Analysis, $CaCO_3$, 97%; 2% $MgCO_3$; 50% thru 100 mesh, 1.50; 50% thru 4 mesh	1.50
Blackwater, Mo.—100% thru 4 mesh	1.00
Branchton, Penn.—100% thru 20 mesh, 60% thru 100 mesh, 45% thru 200 mesh	a5.00
Cape Girardeau, Mo.—Analysis, $CaCO_3$, 94½%; $MgCO_3$, 3½%; 90% thru 50 mesh	1.50
Cartersville, Ga.—90% thru 100 mesh, 2.00; 50% thru 50 mesh	1.50
Chaumont, N. Y.—Pulverized limestone, bags, 4.00; bulk	2.50
Cypress, Ill.—Analysis, 94-98% $CaCO_3$, 2% $MgCO_3$; 90% thru 100 mesh, 1.35; 50% thru 100 mesh, 1.15; 90% thru 50 mesh, 1.15; 50% thru 50 mesh, 1.05; 90% thru 4 mesh, 1.10; 50% thru 4 mesh	1.00
Danbury, Conn., and West Stockbridge, Mass.—Analysis, 90% $CaCO_3$; 5% $MgCO_3$; fine ground, 90% thru 100 mesh; bulk	3.50
Paper bags	4.75
100-lb. cloth bags	5.25
(All prices less .25 cash 15 days)	
Davenport, Ia.—Analysis, 97% $CaCO_3$; 2% and less $MgCO_3$; 90% thru 200 mesh, bags, per ton	6.00
90% thru 20 mesh, bulk, per ton	1.50
Hillsville, Penn.—Analysis, 94% $CaCO_3$; 1.40% $MgCO_3$; 75% thru 100 mesh; sacked	5 00
Jamesville, N. Y.—Analysis, 89% $CaCO_3$, 4% $MgCO_3$; pulverized; bags, 4.25; bulk	2.75
Joliet, Ill.—Analysis, 52% $CaCO_3$; 48% $MgCO_3$; 90% thru 100 mesh	3.50
Knoxville, Tenn.—Analysis, 52% $CaCO_3$; 36% $MgCO_3$; 80% thru 100 mesh, bags, 3.75; bulk	2.50
Marlbrook, Va.—Analysis, 80% $CaCO_3$; 10% $MgCO_3$; bulk	1.75
Marl — Analysis, 95% $CaCO_3$; 0% $MgCO_3$; bulk	2.25
Marion, Va.—Analysis, 90% $CaCO_3$, 2% $MgCO_3$; per ton	2.00
Middlebury, Vt.—Analysis, 99.05% $CaCO_3$; 90% thru 50 mesh	4.25
Milltown, Ind.—Analysis, 94.50% $CaCO_3$, 33% thru 50 mesh, 40% thru 50 mesh; bulk	1.35–1.60
Olive Hill, Ky.—Analysis, $CaCO_3$ 94-98%; 50% & 90% thru 4 mesh	1.00
Piqua, Ohio—Total neutralizing power 101.12%; 60% thru 100 mesh	2.50
100% thru 10, 90% thru 50, 70% thru 100; bags, 5.00; bulk	3.50
100% thru 4, 30% thru 100, bulk	1.50
Rocky Point, Va. — Analysis, $CaCO_3$, 97%; $MgCO_3$, 75%; 50% thru 200 mesh, burlap bags, 3.50; paper, 3.25; bulk	2.00
Sibley, Mich.—Analysis, 87.47% $CaCO_3$; 8.30% $MgCO_3$; 60% thru 100 mesh, bulk, per ton, 2.30; 100-lb. paper bags, f.o.b. Sibley, Mich., per ton	3.75
Watertown, N. Y. — Analysis, 53.72% $CaCO_3$; pulverized; sacks, 4.25; bulk	2.75

(a) Less 50c comm. to dealers per ton.

Agricultural Limestone

(Crushed)

Bedford, Ind.—Analysis, 98% $CaCO_3$; 1% $MgCO_3$; 90% thru 10 mesh	1.50
30% thru 100 mesh	1.50

(Continued on next page)

Agricultural Limestone

Cape Girardeau, Mo.—Analysis, 94½% $CaCO_3$, 3½% $MgCO_3$; 50% thru 50 mesh 1.50

Chico and Bridgeport, Tex. — Analysis, 95% $CaCO_3$; 1.3% $MgCO_3$; 90% thru 4 mesh 1.00–1.25

Charles-Town, W. Va.—Lime Marl—Analysis, 95% $CaCO_3$, 50% thru 100 mesh, bulk, 3.00; including burlap bags 4.50

Colton, Calif.—100% thru 16 mesh, bulk, 4.00; including sacks 5.00

Davenport, Ia.—Analysis, 97% $CaCO_3$; 2% and less $MgCO_3$; 90% thru 10 mesh, per ton 1.25

90% thru 4 mesh, per ton 1.10

Dubuque, Ia.—Analysis, 34.96% $CaCO_3$; 59.62% $MgCO_3$; 90% thru 50 mesh .... .95

Dundas, Ont.—Analysis, 54% $CaCO_3$; $MgCO_3$, 43%; 50% thru 50 mesh 1.00

Ft. Spring, W. Va. — Analysis, 90% $CaCO_3$; 4% $MgCO_3$; 50% thru 100 mesh 1.50

Hillsville, Penn.—Analysis, 94% $CaCO_3$, 1.40% $MgCO_3$; 75% thru 100 mesh, sacked 5.00

Kansas City, Mo.—50% thru 100 mesh.... 1.00

Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% thru 10 mesh; 46% thru 60 mesh 2.00

Screenings (¼ in. to dust) 1.00

Marblehead, Ohio—90% thru 100 mesh.... 3.00

90% thru 50 mesh 2.00

90% thru 4 mesh 1.00

McCook, Ill.—90% thru 4 mesh ..... .95

Middlepoint, Bellevue, Bloomville, Kenton and Whitehouse, Ohio; Monroe, Mich.; Bluffton, Greencastle and Kokomo, Ind. —85% thru 10 mesh, 25% thru 100 mesh 1.50

Moline, Ill., and Bettendorf, Iowa—Analysis, 97% $CaCO_3$, 2% $MgCO_3$; 50% thru 100 mesh; 50% thru 4 mesh 1.50

Mountville, Va. — Analysis, 76.60% $CaCO_3$; $MgCO_3$, 22.83%, 100% thru 20 mesh; 50% thru 100 mesh, paper bags, 4.50; burlap bags 5.00

Stolle and Falling Springs, Ill.—Analysis, 89.9% $CaCO_3$, 3.8% $MgCO_3$; 90% thru 4 mesh 1.15–1.70

Stone City, Iowa — Analysis, 98% $CaCO_3$; 50% thru 50 mesh ..... .75

West Stockbridge, Mass.—Analysis, 95% $CaCO_3$; 50% thru 50 mesh, bulk 3.50

100 lb. paper bags, 4.25*; cloth 5.25

Waukesha, Wis.—90% thru 100 mesh, 4.50; 50% thru 100 mesh 2.10

Valmeyer, Ill.—Analysis, 96% $CaCO_3$, 2% $MgCO_3$; 100% thru 10 mesh 1.10–1.70

*Less 25c cash 15 days.

Pulverized Limestone for Coal Operators

Davenport, Ia.—Analysis 97% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 20 mesh, 50% thru 200 mesh; sacks 6.00

Hillsville, Penn., sacks, 5.10; bulk 3.50

Joliet, Ill.—Analysis, 52% $CaCO_3$; 48% $MgCO_3$; 95% thru 100 mesh; paper bags (bags extra) 3.50

Marblehead, Ohio — Analysis, 83.54% $CaCO_3$; 14.92% $MgCO_3$; 99.8% thru 100 mesh; sacks 4.25

Piqua, Ohio—99% thru 100 mesh, bulk, 3.50; in 80-lb. bags (f.o.b. Piqua) 5.00

Rocky Point, Va.—Analysis, 97% $CaCO_3$; 75% $MgCO_3$; 85% thru 200 mesh, bulk 2.25–3.50

Shaw's Junction, Penn.—Analysis, 91.55% $CaCO_3$; 96% $MgCO_3$; 70% thru 100 mesh, bulk 4.50

Waukesha, Wis.—90% thru 100 mesh, bulk 4.50

Glass Sand

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

Cedarville and S. Vineland, N. J. *1.75–2.25

Cheshire, Mass., in carload lots 5.00–7.00

Estill Springs and Sewanee, Tenn. 1.50

Franklin, Penn. 2.00

Klondike, Mo. 2.00

Massillon, Ohio 3.00

Michigan City, Ind. ..... .30– .35

Ohlton, Ohio 2.50

Ottawa, Ill. 1.25

Red Wing, Minn. 1.50

San Francisco, Calif. 4.00–5.00

Silica and Mendota, Va. 2.00–3.00

St. Louis, Mo. 2.00

Utica and Ottawa, Ill. 75–1.00

Zanesville, Ohio 2.50

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Beach City, Ohio		1.50
Dresden, Ohio		1.25
Eau Claire, Wis.	4.30	.60–1.00
Estill Springs and Sewanee, Tenn.	1.35–1.50	1.35–1.50
Franklin, Penn.		1.75
Massillon, Ohio		2.00
Michigan City, Ind.		.30

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Asbury Park, Farmingdale, Spring Lake and Wayside, N. J.	.50	.50	1.15	1.25	1.25	
Attica and Franklinville, N. Y.	.75	.75	.75	.75	.75	.75
Boston, Mass.‡	1.40	1.40	2.25		2.25	2.25
Buffalo, N. Y.	1.00	1.05	1.05			
Erie, Penn.	.60	.85	1.30	1.30	1.30	
Leeds Junction, Me.		.50	1.75a		1.25	1.00c
Machias Jct., N. Y.	.75	.75	.75		.75	.75
Milton, N. H.		.50				.90
Montoursville, Penn.	1.00	.70	.60	.60	.50	.50
Morrisville, Penn.	.50	.40	.90	1.00	1.00	
Northern New Jersey	.40– .50	.40– .50	1.25		1.25	
South Portland, Me.		1.00	2.25			2.00
Troy, N. Y.	.50– .75*	.50– .75*	.80–1.00*	.80–1.00*		.80–1.00*
F. o. b. boat, per yd.	1.50	1.50	1.75	1.75		1.75
Washington, D. C.	.60	.60	1.20	1.20	1.00	1.00
Georgetown, D. C.	.55	.55	1.20	1.20	1.00	1.00
CENTRAL:						
Algonquin, Ill.	.50	.35	.25	.45	.45	.50
Appleton, Minn.		.50	1.25		1.50	
Attica, Ind.			All sizes .75–.85			
Barton, Wis.		.40s	.50s	.65s	.65s	.65s
Chicago, Ill.	.50	.50–1.45n	.60	.60–1.55n	.60	.60–1.90n
Columbus, Ohio		.75¶	.75¶	.75¶	.75¶	
Des Moines, Iowa	.60	.60	1.50	1.50	1.50	1.50
Eau Claire, Chippewa Falls, Wis.		.40	.55	.95	.85	
Elkhart Lake and Glenbeulah, Wis.	.30	.30	.50	.50	.50	.50
Grand Haven, Mich.		.60		.90		.90
Grand Rapids, Mich.	.50	.50	.90	.80	.70	.70
Hamilton, Ohio		.85	.85		.85	
Hersey, Mich.		.50		.60	.70	.70
Humboldt, Iowa	.50	.50	1.40	1.40	1.40	1.40
Indianapolis, Ind.	.50– .75	.40– .60	.50– .75	.50– .75	.60– .85	.60– .85
Mankato, Minn. (h)	.55	.45			1.25	
Mason City, Iowa		.60	.85	1.25	1.25	1.25
Mattoon, Ill.			.75–.85 all sizes			
Milwaukee, Wis.	.91	.91	1.06	1.06	1.06	1.06
Minneapolis, Minn. (g)	.35	.35	1.35	1.35	1.35	1.25
St. Louis, Mo. (b)	1.30e	1.30f	1.55t	1.55	1.55	1.65
St. Louis, Mo.†	2.00e	2.00f	2.25t	2.25	2.25	2.35
St. Paul, Minn.	.35	.35	1.25	1.25	1.25	1.25
Terre Haute, Ind.	.75	.60	.75	.75	.75	.75
Waukesha, Wis.		.45	.60	.60	.65	.65
Winona, Minn.	.40	.40	.50	1.10	1.10	1.25
SOUTHERN:						
Brewster, Fla.	.50	.50				
Brookhaven, Miss.	1.25	.70	1.25	1.00	.70	.70
Charleston, W. Va.			River sand and gravel, all sizes, 1.40			
Eustis, Fla.		.45– .50				
Fort Worth, Texas	.75	.85–1.00	1.00–1.10	1.00–1.10	1.00–1.10	1.00–1.10
Gainesville, Texas					.55	
Knoxville, Tenn.	.85	.85	1.50	1.20	1.20	1.20
Macon, Ga.	.65– .90	.65– .90	2.25–2.50	2.25–2.50	2.25–2.50	2.25–2.50
New Martinsville, W. Va.	1.10	1.00		1.30	1.10	.90
Roseland, La.	.30	.30	1.00	.80	.80	.80
WESTERN:						
Kansas City, Mo.	.70– .80	.70– .75				
Crushton, Durbin, Kincaid, Largo, Rivas, Calif.	.10– .40	.10– .40	.50–1.00	.50–1.00	.50–1.00	.50–1.00
Los Angeles, Calif.	.10– .40	.10– .40	.20– .90	.50– .90	.50– .90	.50– .90
Oregon City, Ore.			All grades range from 1.00 to 1.50 per cu. yd.			
Otay, Calif.		.35– .40	.50– .60	.50– .60	.50– .60	.50– .60
Phoenix, Ariz. (k)	1.25*	1.15*	1.50*	1.15*	1.15*	1.00*
Pueblo, Colo.	.70	.60		1.25		1.15
Seattle, Wash.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Steilacoom, Wash.	.50	.50	.50	.50	.50	.50

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
Algonquin and Beloit, Wis.			.40			
Appleton, Minn.	.55					
Brookhaven, Miss.						.60
Buffalo, N. Y.	1.10	.95		.85		.35
Burnside, Conn.		.75*				
Chicago, Ill.	1.25m			.35		
Des Moines, Iowa				.85		
Dresden, Ohio				.70	.65	
Eau Claire, Chippewa Falls, Wis.					.65	
Fort Worth, Texas						.67– .75
Gainesville, Tex.					.55	
Grand Rapids, Mich.				.50		
Hamilton, Ohio					.70	
Hersey, Mich.				.50		
Indianapolis, Ind.			Mixed gravel for concrete work, at .65			
Macon, Ga.	.35					
Mankato, Minn.	.70					
Oregon City, Ore.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Roseland, La.				.60	.60	.60
Steilacoom, Wash.	.25	.25	.25	.25	.25	.25
St. Louis, Mo.			Mine run gravel, 1.55 per ton			
Summit Grove, Ind.	.50	.50	.50	.50	.50	.54
Winona, Minn.						.60
York, Penn.	1.10	1.00				

*Cubic yd. ‡Delivered on job by truck. (a) ⅝-in. down. (b) 1½- to ¼-in., 1.65. (c) 2½-in. and less. ¶By truck only. (d) Delivered in Hartford, Conn., $1.50 per yd. (e) Mississippi River. (f) Meramee River. (g) Per yd., del. by truck, ¼-in. down, 1.25; 2 in. and less, 2.40. (h) ¼- to ¾-in., 1.25. (j) Lake sand, 1.75, delivered. (k) 60–70% crushed boulders. (m) Cu. yd., dune sand, f.o.b. cars, Chicago. (n) Cu. yd., f.o.b. cars, Chicago. (r) Pit run. (s) Plus 15c for winter loading. (t) Fine and regular binder. (u) Coarse, torpedo, also roofing. (v) Coarse binder. †2% discount if paid by 15th of month following delivery.

Core and Foundry Sands

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

City or shipping point	Molding, fine	Molding, coarse	Molding brass	Core	Furnace lining	Sand blast	Stone sawing
Albany, N. Y.	2.00	2.00	2.25			3.75	
Beach City, Ohio	1.75	1.75		1.50	1.50		
Cheshire, Mass.	Sand for soap, 7.00–8.00					6.00–8.00	
Dresden, Ohio	1.25–1.50	1.25–1.50	1.50–1.75	1.00–1.25			
Eau Claire, Wis.						2.50–3.00	
Elco, Ill.	Ground silica, 92-99½% thru 325 mesh, 16.00–35.00 per ton						
Estill Springs and Sewanee, Tenn.	1.25			1.25		1.35–1.50	
Franklin, Penn.	1.75	1.75		1.75			
Kasota, Minn.							1.00
Kerrs, Ohio	1.00–1.50	1.25–2.00	2.00			2.75–3.00	
Klondike, Mo.	2.00			2.00	2.00		
Masillon, Ohio	2.25	2.25		2.25	2.50		
Michigan City, Ind.				.30– .35			
Montoursville, Penn.				1.35–1.50			
New Lexington, Ohio	2.00	1.25					
Ohlton, Ohio	1.75	1.75		2.00	1.75	1.75	
Ottawa, Ill.	1.25	1.25	1.25	1.25	1.25	3.50	3.00
Red Wing, Minn. (d)					1.50	3.00	1.50
San Francisco, Calif.[1]	3.50†	5.00†	3.50†	3.50–5.00†	3.50–5.00†	3.50–5.00†	
Silica, Mendota, Va.	2.50				2.50		2.00
Utica and Ottawa, Ill.	.40–1.00f	.40–1.00f	.75–1.00	.40–1.00f	.60–1.00f	2.23–3.25	1.00–3.25
Warwick, Ohio	1.50*–2.00h	1.50*–2.00h		1.50*–2.00h			
Zanesville, Ohio	2.00	1.50	2.00	2.50	2.00		

*Green. †Fresh water washed, steam dried. [1]Core, washed and dried, 2.50. (d) Filter sand, 3.00. (e) Filter sand, 3.00–4.25. (f) Crude and dry. (g) Potters sand, 8.00–10.00–12.00; building sand, 1.75–2.00. (h) Washed, 1.75.

Crushed Slag

City or shipping point	Roofing	¼ in. down	½ in. and less	¾ in. and less	1½ in. and less	2½ in. and less	3 in. and larger
EASTERN:							
Buffalo, N. Y., Erie and Du Bois, Penn.	2.25	1.25	1.25	1.35	1.25	1.25	1.25
Eastern Penn.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Northern New Jersey	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Reading, Penn.	2.00	1.00		1.00			
Western Pennsylvania	2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, Ohio		1.30*		1.45*		1.45*	
Jackson, Ohio	2.05*	1.05*	1.80*	1.30*	1.05*	1.30*	
Toledo, Ohio	1.50	1.10	1.25	1.25	1.25	1.25	1.25
SOUTHERN:							
Ashland, Ky.	2.05*	1.45*	1.80*	1.45*	1.45*	1.45*	
Ensley and Alabama City, Ala.	2.05	.55	1.25	1.15	.90	.90	.80
Longdale, Roanoke, Ruesens, Va.	2.50	.75	1.25	1.25	1.25	1.15	1.05
Woodward, Ala.†	2.05	.55*		1.15*	.90*	.90*	

5c per ton discount on terms. †1¼ in. to ¼ in., $1.05; ⅝ in. to 10 mesh, $1.25*; ⅝ in. to 0 in., .90*; ¼ in. to 10 mesh, .80*.

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime, Blk.	Lump lime, Bbl.
EASTERN:								
Berkeley, R. I.			12.00			17.50		2.00
Buffalo, N. Y.	11.50	7.50	7.50	12.00	8.00	11.00	7.50	1.50[10]
Lime Ridge, Penn.							5.00	
West Stockbridge, Mass.	12.00	10.00	5.60					2.00[13]
Williamsport, Penn.	10.00–11.00	8.50–9.00	8.50–9.00		7.00	9.00	5.00	
York, Penn., & Oranda, Va.	11.50[7]	8.50–9.50[7]	8.50–9.50[7]	8.50–10.50[7]	8.00	9.25	7.00	1.40[8]
CENTRAL:								
Afton, Mich.						10.75	7.50	12.11
Carey, Ohio	11.50	7.50	7.50		8.00		7.50	1.50
Cold Springs, Ohio		6.50	6.50					
Gibsonburg, Ohio	9.50				8.00	10.00		
Huntington, Ind.	11.50	7.50	7.50	12.00	8.00	11.00	7.50	1.50[10]
Luckey, Ohio	11.50							
Milltown, Ind.		8.50–10.00		10.00[8]			8.50[22]	1.35[10]
Ohio points	11.50	7.50	7.50	12.00	8.00	11.00[23]	7.50	1.50[10]
Scioto, Ohio	10.50	7.50	7.50	8.50	8.00	.62½	7.00	1.50
Sheboygan, Wis.		10.50	10.50	10.50			9.50	2.00
Wisconsin points[6]		11.50					9.50	
Woodville, Ohio[26]	9.50	6.50	6.50	10.50[24]	8.00	10.00[9]	8.00	1.40[3]
SOUTHERN:								
El Paso, Texas							7.00	1.50
Frederick, Md.		8.00–9.50	8.00–9.50			9.50[15]	7.00[15]	
Graystone & Landmark, Ala.	12.50	9.00		12.50	8.50		7.50	1.35
Keystone, Ala.	17.00	9.00	9.00	10.00			7.50	1.35
Knoxville, Tenn.	17.00	9.00	9.00	9.00	7.50	.62½	7.50	1.35
Ocala and Kendrick, Fla.		11.00						.75[21]
WESTERN:								
Kirtland, N. M.							10.00	
Los Angeles, Calif.	15.00	14.00	12.00	18.00			13.50	
San Francisco, Calif.	19.50	15.00	13.00	15.00–19.00	14.50[20]	.90[17]	14.50[19]	1.85[17]
Tehachapi, Calif.[18]	10.80		6.75[11]	12.00			10.30	
Seattle, Wash.	19.00	19.00	12.00	19.00	19.00		18.60	2.30

[1] Barrels. [2] Net ton. [3] Wooden, steel, 1.60. [5] Dealers' prices, net 30 days less 25c discount per ton on hydrated lime and 5c per bbl. on lump if paid in 10 days. [7] In paper bags, including bags. [8] To 11.00. [9] 80-lb. [10] In bags. [11] Refuse or air slack, 10.00–12.00. [12] To 3.00. [13] Delivered in Southern California. [15] To 8.00. [16] To 1.70. [17] Less credit for return of empties. [18] 90-lb. sacks. [19] To mortar plant and large industrials, 13.00. [20]Also 13.00. [21] Per ½-bbl. bag. [22] To 9.00. [23] Per bbl., 2.15. [24] Superfine, 99.25% thru 200 mesh. [25] To 16.50. [26] General purpose hydrated lime in 10-lb. paper sacks, 12.50 per ton.

Miscellaneous Sands

(Continued)

City or shipping point	Roofing sand	Traction
Montoursville, Penn.		1.25
Ohlton, Ohio	1.75	1.75
Ottawa, Ill.	3.25	1.25
Red Wing, Minn.		1.00
San Francisco, Calif.	3.50	3.50
Silica, Va.		1.75
Utica and Ottawa, Ill.	1.00–3.25	.75
Warwick, Ohio		2.00
Zanesville, Ohio		2.50

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Chatsworth, Ga.:	
Crude talc, per ton	5.00
Ground talc (20-50 mesh), bags	7.50
Ground talc (150-200 mesh), bags	10.00
Pencils and steel crayons, gross	1.50– 2.50
Chester, Vt.:	
Ground talc (150-200 mesh), paper bags (bags extra)	8.00– 8.50
Same, including 50-lb. bags	9.00– 9.50
Chicago and Joliet, Ill.:	
Ground (150-200 mesh), bags	30.00
Clifton, Va.:	
Crude talc, per ton	4.00
Ground talc (150-200 mesh), in bags	12.00
Conowingo, Md.:	
Crude talc, bulk	4.00
Ground talc (150-200 mesh), in bags	14.00
Cubes, blanks, per lb.	.10
Dalton, Ga.:	
Crude talc (for grinding)	4.00
Ground talc (150-200 mesh), bags	9.00
Pencils and steel worker's crayons, per gross	1.00– 2.00
Emeryville, N. Y.:	
Ground talc (200 mesh), bags	13.75
Ground talc (325 mesh), bags	14.75
Hailesboro, N. Y.:	
Ground talc (300-350 mesh) in 200-lb. bags	15.50–20.00
Henry, Va.:	
Crude (mine run)	3.50– 4.00
Ground talc (150-200 mesh), bags	7.75–11.00
Joliet, Ill.:	
Ground talc (200 mesh) in bags:	
California white	30.00
Southern white	20.00
Illinois talc	10.00
Crude talc	3.75
Keeler, Calif.:	
Ground (200-300 mesh), bags	20.00–30.00
Los Angeles, Calif.:	
Ground talc (150-200 mesh) in bags	15.00–24.00
Natural Bridge, N. Y.:	
Ground talc (300-325 mesh), bags	12.00–15.00

(a) Bags extra.

Rock Phosphate

Prices given are per ton (2240-lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock

Columbia, Tenn.—B.P.L. 65-70%	3.50– 4.50
Gordonsburg, Tenn.—B.P.L. 68-70%	3.75–4.25
Mt. Pleasant, Tenn.—B.P.L., 75%	6.50
Tennessee — F.o.b. mines, gross ton, unground brown rock, B.P.L. 72%	5.00
B.P.L. 75%	6.00
Twomey, Tenn.—B.P.L. 65%, 2000 lb.	8.00– 9.00

Ground Rock

(2000 lb.)

Centerville, Tenn.—B.P.L. 65%	8.00
Gordonsburg, Tenn.—B.P.L. 65–70%	3.75– 4.50
Mt. Pleasant, Tenn.—Lime phosphate:	
B.P.L., 73%, 80% thru 300 mesh	11.80
Mt. Pleasant, Tenn.—B.P.L., 72%	5.00– 5.50
Twomey, Tenn.—B.P.L. 65%	8.00
Wales, Tenn.—B.P.L. 65%	11.00

Florida Phosphate

(Raw Land Pebble)

(Per Ton)

Florida—F.o.b. mines, gross ton, 68/66% B.P.L., Basis 68%	3.25
70% min. B.P.L., Basis 70%	3.75

Mica

Prices given are net, f.o.b. plant or nearest shipping point.

Bedford, N. Y.—Mine scrap	12.50–14.70
New York City, N. Y.—Per lb.,	
Cut mica (1½x2)	1.60
Cut mica (8x10)	26.00
Pringle, S. D.—Mine run, per ton	125.00
Punch mica, per lb.	.06
Scrap, per ton, carloads	20.00
Rumney Depot, N. H.—Per ton,	
Mine run	300.00–360.00
Clean shop scrap	27.50–29.00
Mine scrap	22.50
Roofing mica	a37.50–40.00
Punch mica, per ton	200.00–240.00
Trimmed mica, per ton, 40 mesh, 42.50–45.00; 100 mesh, 60.00; 200 mesh	100.00
Trenton, N. J.—Mine scrap, per ton	20.00
Clean shop scrap, per ton	22.00

(a) Also 38.00–42.50 per ton.

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Brandon, Vt.—English pink, cream, and American Botticino, coral pink, pearl blush	‖12.50–‖14.50	¶12.50–‖14.50
Brighton, Tenn.—Pink marble chips	$3.00	$3.00
Crown Point, N. Y.—Mica Spar		¶9.00–‖12.00
Davenport, Ia.—White limestone, in ba	6.00	6.00
Easton, Penn.—Royal green	16.00–20.00a	
Harrisonburg, Va. — Bulk marble (crushed, in bags)	12.50–14.00	12.50–14.00
Ingomar, Ohio — Concrete facings and stucco dash		11.00–18.00
Middlebrook, Mo.—Red		20.00–25.00
Middlebury, Vt. — Middlebury white		‖9.00–¶10.00
Middlebury and Brandon, Vt.—Caststone, per ton, including bags		5.50
Phillipsburg, N. J.—Royal green granite		18.00–20.00
Randville, Mich.—Crystalite white marble, bulk	4.00	4.00– 7.00
Stockton, Calif.—"Nat-rock" roofing grits		12.00–20.00
Tuckahoe, N. Y.—Tuckahoe white	8.00	
Warren, N. H.		7.90– 8.40
Wellsville, Colo.—Colorado Travertine Stone	15.00	15.00
Whitestone, Ga.	b5.00	

†C.L.; L.C.L. 16.00. ¶C.L. ‖L.C.L. (a) Including bags. (b) In burlap bags, 2.00 per ton extra. *Per 100 lb.

Soda Feldspar

DeKalb Jct., N. Y.—Color, white; pulverized, 99% thru 200 mesh, in bags, per ton, 22.00, bulk 20.00; 99% thru 140 mesh, in bags, ton, 20.00; bulk.... 18.00

Potash Feldspar

Auburn and Topsham, Me.—Color white, 98% thru 140-mesh 19.00

Bedford Hills, N. Y.—Color, white; analysis, K_2O, 12.26%; Na_2O, 2.86%; SiO_2, 66.05%; Fe_2O_3, .08%; Al_2O_3, 18.89%; pulverized 78% thru 100 mesh, bulk, 11.00–14.00; crude, bulk, per ton 9.00

Coatesville, Penn.—Color, white; analysis, K_2O, 12.30%; Na_2O, 2.90%; SiO_2, 67%; Fe_2O_3, .08%; Al_2O_3, 16%, crude, per ton 8.00

Trenton, N. J.—White; analysis, K_2O, 13-14%; Na_2O, 2-2½%; SiO_2, 64-65%; Fe_2O_3, 0.07%; Al_2O_3, 18.50-19.25%; pulverized, 97% thru 325 mesh, crude, 8.50 per ton, ground..... 21.00

Rochester, N. Y. 22.00

Los Angeles, Calif.—Color, white; analysis, K_2O, 12.16%; Na_2O, 1.53%; SiO_2, 65.60%; Fe_2O_3, .10%; Al_2O_3, 19.20%; Arizona spar, crude, bags, 12.50–14.00; bulk 11.00–12.50

Pulverized, 95% thru 200 mesh; bags, 19.73–23.50; bulk 15.75–22.50

Pulverized, 20% thru 80 mesh; bags, 17.60; bulk 16.50

Rumney and Cardigan, N. H.—Color, white; analysis, K_2O, 9-12%; Na_2O, trace; SiO_2, 64-67%; Al_2O_3, 17-18%, crude, bulk 7.00– 7.50

Rumney Depot, N. H.—Color, white; analysis, K_2O, 8-13%; Na_2O, 1-1½%; SiO_2, 62-68%; Al_2O_3, 17-18%, crude, bulk 7.00– 7.50

Penland, N. C.—White; crude, bulk..... 8.00

Ground, bulk 16.50

Spruce Pine, N. C.—Color, white; analysis, K_2O, 10%; Na_2O, 3%; SiO_2, 68%; Fe_2O_3, 0.10%; Al_2O_3, 18%; 99½% thru 200 mesh; pulverized, bulk 18.00

(Bags 15c extra.)

Tennessee Mills—Color, white; analysis, K_2O, 10%; Na_2O_3, 3%; SiO_2, 68%; 99½% thru 200 mesh; bulk (Bags, 15c extra) 18.00

Chicken Grits

Afton, Mich.—(Limestone), per ton	1.75
Belfast, Me.—(Limestone), per ton	‡10.00
Centerville, Iowa	9.25
Chico, Tex.—Hen size and Baby Chick, packed in 100-lb. sacks, per ton	10.00
Coatesville, Penn.—(Feldspar), per ton, in bags of 100 lb. each	8.00
Danbury, Conn.; Adams, Ashley Falls, and West Stockbridge, Mass.—(Limestone)	‡7.50–*9.00
Davenport, Ia.—(Limestone), bags, per ton	6.00
Easton, Penn.—In bags	8.00
El Paso, Tex.—Per ton	1.00
Knoxville, Tenn.—Per bag	1.25
Los Angeles, Calif.—Per ton, including sacks:	
Feldspar	14.00
Gypsum	7.50– 9.50
Marion, Va.—(Limestone), bulk, 5.00; bagged, 6.50; 100-lb. bag	.50
Middlebury, Vt.—Per ton (a)	10.00
Piqua, O. (b)—(Pearl Grit), fine and medium, per ton	¶8.00
Randville, Mich.—(Marble), bulk	6.00
Rocky Point, Va.—(Limestone), 100-lb. bags, 50c; sacks, per ton, 6.00; bulk	5.00
Seattle, Wash.—(Gypsum), bulk, ton	10.00
Tuckahoe, N. Y.	8.00
Waukesha, Wis.—(Limestone), per ton	8.00
West Stockbridge, Mass.	7.50– 9.00
Wisconsin Points—(Limestone), per ton	15.00
Winona, Minn.—(Limestone), sacked, per ton, 8.00; bulk, per ton	6.00

*L.C.L. †Less than 5-ton lots. ‡C.L. ¶100-lb. bags.

(a) F.o.b. Middlebury, Vt. (b) F.o.b. Piqua, Ohio.

Sand-Lime Brick

Prices given per 1000 brick f.o.b. plant or nearest shipping point, unless otherwise noted.

Albany, Ga.	11.00
Barton, Wis.	10.50
Boston, Mass.	17.00*
Brighton, N. Y.	19.75*
Dayton, Ohio	12.50–13.50
Detroit, Mich. (h)	j13.00–16.00*d
Farmington, Conn.	16.00
Flint, Mich.	18.00†
Grand Rapids, Mich.*	14.00–15.00
Hartford, Conn.	13.00–17.00*
Jackson, Mich.	13.00
Lakeland, Fla.	10.00–11.00
Lake Helen, Fla.	9.00–12.00
Madison, Wis.	12.50a
Mishawaka, Ind.	11.00
Milwaukee, Wis.	13.00*
Minneapolis, Minn.	10.00
New Brighton, Minn.	10.00
Pontiac, Mich.	15.50
Portage, Wis.	15.00
Prairie du Chien, Wis.	18.00–22.50
Rochester, N. Y.	19.75
Saginaw, Mich.	13.50
San Antonio, Texas	12.50
Sebewaing, Mich.	12.50
Sioux Falls, S. Dak.	13.00
South River, N. J.	13.00
South St. Paul, Minn.	9.00
Syracuse, N. Y.	18.00–20.00
Toronto, Canada (r)	12.50–15.00g
Wilkinson, Fla.	12.00–16.00
Winnipeg, Canada	15.00

Delivered on job. ‖Dealers' price. (a) Less 50c disc. per M, 10th of month. (d) 5% disc., 10th of month. (f) In yard, 12.00, 12.25 and 12.50. (g) Delivered in city. (h) Also 15.50. (j) Also 14.00. (r) Also 12.00.

Portland Cement

	Per Bag	Per Bbl.	High Early Strength
Albuquerque, N. M.	.78¾	3.45	.....
Atlanta, Ga.	.....	2.06*	3.16¶
Baltimore, Md.	.....	2.25	3.55¶
Birmingham, Ala.	.....	1.70*	2.80¶
Boston, Mass. (g)	.44½	1.78–1.88	3.27¶
Buffalo, N. Y.	.48¾	1.95–2.45*	3.35¶
Butte, Mont.	.90¼	3.61	.....
Cedar Rapids, Ia.	.....	2.04	2.99f
Charleston, S. C.	.....	2.35d	3.15¶
Cheyenne, Wyo.	.59	2.66	.....
Chicago, Ill.	.....	1.85	3.35¶
Cincinnati, Ohio	.....	1.92	3.47¶
Cleveland, Ohio	.....	1.94–2.64*	3.34¶
Columbus, Ohio	.....	2.22	3.52¶
Dallas, Texas	.....	1.80	3.39¶
Davenport, Iowa	.....	2.04	.....
Dayton, Ohio	.....	2.21	3.51¶
Denver, Colo.	.63¾	2.55	.....
Des Moines, Iowa	.....	2.14	2.99f
Detroit, Mich.	.....	1.95	3.25¶
Duluth, Minn.	.....	1.84	.....
Houston, Texas	.....	1.90	3.63¶
Indianapolis, Ind.	.54¾	2.09	f2.84–3.39¶
Jackson, Miss.	.....	2.14*	3.24¶
Jacksonville, Fla.	.....	2.31b	3.26¶
Jersey City, N. J.	.....	2.13	3.43¶
Kansas City, Mo.	.45½	1.82	f2.87–3.22¶
Los Angeles, Calif.	.51½	1.82	.....
Louisville, Ky.	.55½	2.47	f2.92–3.37¶
Memphis, Tenn.	.....	2.14*	f2.69–3.24¶
Milwaukee, Wis.	.....	2.00	3.50¶
Minneapolis, Minn.	.....	2.02	.....
Montreal, Que.	.....	1.60	.....
New Orleans, La.	.45½	1.82	3.22¶
New York, N. Y.	.48¼	1.93	3.33¶
Norfolk, Va.	.....	1.97	3.27¶
Oklahoma City, Okla.	.57¼	2.29	3.69¶
Omaha, Neb.	.54	2.16	3.56¶
Peoria, Ill.	.....	2.02	.....
Pittsburgh, Penn.	.....	1.85	3.35¶
Philadelphia, Penn.	.....	2.15	3.45¶
Phoenix, Ariz.	.....	3.91*	.....
Portland, Ore.	.....	2.40	.....
Reno, Nev.	.....	2.86	.....
Richmond, Va.	.....	2.32	3.62¶
Salt Lake City, Utah	.70¼	2.81	.....
San Francisco, Calif.	.....	2.14	.....
Savannah, Ga.	.....	2.31c	3.15¶
St. Louis, Mo.	.48¾	1.95	f2.65–3.25¶
St. Paul, Minn.	.....	2.02	.....
Seattle, Wash.	.....	†2.50–2.65j	f3.50†
Tampa, Fla.	.....	2.30	3.30¶
Toledo, Ohio	.....	2.03	3.50¶
Topeka, Kan.	.50¼	2.01	3.41¶
Tulsa, Okla.	.53¼	2.13	3.53¶
Wheeling, W. Va.	.....	2.12	3.42¶
Winston-Salem, N. C.	.....	2.19	3.49¶
Mill prices f.o.b. in carload lots, without bags, to contractors.			
Albany, N. Y.	.....	2.15	.....
Bellingham, Wash.	.....	2.10	.....
Buffington, Ind.	.....	1.60	.....
Chattanooga, Tenn.	.....	2.45*	.....
Concrete, Wash.	.....	2.35	.....
Davenport, Calif.	.....	2.05	.....
Hannibal, Mo.	.....	1.90	.....
Hudson, N. Y.	.....	1.75	.....
Leeds, Ala.	.....	1.65	.....
Lime & Oswego, Ore.	.....	2.50‡	.....
Mildred, Kan.	.....	2.35	.....
Nazareth, Penn.	.....	2.15	.....
Northampton, Penn.	.....	1.75	.....
Richard City, Tenn.	.....	2.05	.....
Steelton, Minn.	.....	1.65	.....
Toledo, Ohio	.....	2.20	.....
Universal, Penn.	.....	1.60	.....

NOTE—Add 40c per bbl. for bags. *Includes sacks. †10c disc., 10 days. ‡10c disc., 15 days. (b) 5c bbl. refund for paid freight bill. (c) 16c bbl. refund for paid freight bill. (d) 20c bbl. refund for paid freight bill. (e) Paid freight bill taken as part payment of invoice. (f) "Velo" cement, including cost of paper bag, 10c disc. 10 days. ¶"Incor" Perfected, prices per bbl. packed in paper sacks, subject to 10c disc. 15 days. (g) Also 2.33 per bbl. (j) 25c bbl. disc. 10 days.

Gypsum Products— CARLOAD PRICES PER TON AND PER M SQUARE FEET, F.O.B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco Calcined Gypsum	Cement and Gaging Plaster	Wood Fiber	Gaging White	Plaster Sanded	Cement Keene's	Finish Trowel	—Plaster Board— ⅜x32x 36". Per M Sq. Ft.	⅜x32x 36". Per M Sq. Ft.	Wallboard. ⅜x32 or 48" Lengths 6'-10'. Per M Sq. Ft.
Acme, Tex.	1.50–3.00	4.00	4.00	4.00–6.00	4.00–6.00	4.00–6.00	10.00	10.00	19.00	19.00	10.50	10.50	12.00
Blue Rapids, Kan.	1.50–3.00	4.00	4.00	4.00–6.00	4.00–6.00	4.00–6.00	10.00	10.00	19.00	19.00	10.50	10.50	12.00
Centerville, Iowa	.....	.....	6.00	7.00	.....	7.50	8.50	10.50e	.....	.....	.....	.....	.....
Delawanna, N. J.	.....	.....	.....	4.50–5.00	13.10–14.00	5.00	.....	7.25	.....	.....	.....	.....	25.00

East St. Louis, Ill.—Special Gypsum Products—Partition section, 4 in. thick, 12 in. wide, and up to 10 ft. 3 in. long, 12c per ft., 21.00 per ton; outside wall section and interior bearing wall section, 6 in. wide, 6 in. thick, and up to 10 ft. 3 in. long, 25c per ft., 30.00 per ton; floor section, 7 in. thick, 16 in. wide, and up to 13 ft. 3 in. long, 17c per ft., 23.00 per ton.

Ft. Dodge, Iowa; N. Holston, Va.; Akron, N. Y.	1.50–3.00	4.00	4.00	4.00–6.00	4.00–6.00	4.00–6.00	10.00	10.00	19.00	19.00	10.50	10.50	12.00
Grand Rapids, Mich.	1.50–3.00	4.00	4.00	4.00–6.00	4.00–6.00	4.00–6.00	10.00	10.00	19.00	19.00	10.50	10.50	12.00
Los Angeles, Calif. (f)	5.00	.....	7.50–9.50	12.20	.....	.....	12.20–14.10	13.10	29.00–40.00	11.20–13.10	.....	.....	33.75–41.25
Medicine Lodge, Kan.	.....	.....	.....	.....	.....	.....	.....	.....	15.00y	.....	.....	.....	.....
Portland, Colo.	.....	7.00	7.00	9.00	9.00	9.50	9.00	.....	27.50	.....	22.50	27.50	.....
Providence, R. I. (x)	.....	.....	.....	12.00–13.00o	.....	.....	.....	.....	.....	.....	.....	.....	.....
Seattle, Wash. (z)	6.00	9.00	9.00	13.00	.....	.....	14.00	.....	.....	.....	.....	.....	.....
Winnipeg, Man.	5.00	5.00	7.00	13.00	14.00	14.00	.....	.....	.....	.....	20.00w	25.00	33.00

NOTE—Returnable bags, 10c each; paper bags, 1.00 per ton extra (not returnable), (a) Hardwall plaster, 13.00; casting, finishing molding, 14.00; (b) Calacoustic plaster, 10.00 at mill; (c) Plaster lath; (d) ¼x48x36 in.; (e) white molding; (f) plasterboard, 18½c to 25c sq. yd.; (m) includes paper bags; (o) includes jute sacks; (u) includes sacks; (v) retail, 35.00; (w) 16x48; (x) "Fabricaste" gypsum blocks, 2-in., 7c-8c per sq. ft.; 3-in., 7c-8½c per sq. ft. Block setting plaster, per ton, in jute sacks, 12.00. (y) Jute sacks, 18.00; paper sacks, 16.00. (z) Gypsum partition tile, 3-in., 9c per sq. ft.; 4-in., 11c per sq. ft.

Market Prices of Cement Products and Slate

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point.

City or shipping point	Size 8x8x16
Camden, N. J.	16.50
Cement City, Mich.	55.00¶
Chicago District‖	180.00–210.00a
8x10x16	230.00–260.00a
8x12x16	280.00–330.00a
Columbus, Ohio	15.00c– 17.00†
Detroit, Mich. (d)	.15– .17†
Forest Park, Ill.	21.00*
Grand Rapids, Mich.	11.00*
Graettinger, Iowa	.18– .20
Indianapolis, Ind.	.10– .12a
Los Angeles, Calif.	4x8x12–5.00*
Olivia and Mankato, Minn.	9.50b
Tiskilwa, Ill.	.16– .18†
Yakima, Wash.	20.00*

*Price per 100 at plant. †Rock or panel face. ‡Delivered. ¶5x8x12, 55.00 per 1000. (a) Face. (b) Per ton. (c) Plain. (d) 8x12x16, rock or panel face, .24–.26.

Cement Building Tile

Camden and Trenton, N. J.:	
3x8x16, per 100, 9.00; 3x9x16, per 100	9.00
4x8x16, per 100, 12.00; 4x9x16, per 100	13.00
6x8x16, per 100, 16.50; 6x9x16, per 100	15.50
Cement City, Mich.:	
5x8x12, per 100	5.00
Chicago District (Haydite):	
4x 8x16, per 100	13.00
8x 8x16, per 100	20.00
8x12x16, per 100	28.00
Columbus, Ohio:	
5x8x12, per 100	6.00
Detroit, Mich.:	
5½x8x12, per M	75.00
Grand Rapids, Mich.:	
5x8x12, per 100	6.00
Longview, Wash.:	
4x6x12, per 100	5.00
4x8x12, per 100	6.25
Mt. Pleasant, N. Y.:	
5x8x12, per M	78.00
Houston, Texas:	
5x8x12 (Lightweight), per M	80.00

Cement Roofing Tile

Prices are net per square, carload lots, f.o.b. nearest shipping point, unless otherwise stated.

Camden and Trenton, N. J.—8x12, per sq.:	
Red	15.00
Green	18.00
Cicero, Ill.—French and Spanish tile (red, orange, choc., yellow, tan, slate, gray) per sq., 9.50–10.00; green or blue, per sq.	11.50–12.00
Detroit, Mich.—5x8x12, per M	67.50
Houston, Texas—Roofing Tile, per sq.	25.0.
Indianapolis, Ind.—9x15-in.	Per sq.
Gray	10.00
Red	11.00
Green	13.00
Wildasin Spur, Los Angeles, Calif. (Stone-Tile):	
3½x6x12, per M	50.00
3½x8x12, per M	60.00
Prairie du Chien, Wis.:	
5x8x12, per M	82.00
5x4x12, per M	46.00
5x8x6 (half-tile), per M	41.00
5x8x10 (fractional), per M	82.00
Yakima, Wash. (Building Tile):	Each
5x8x12	.10

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	22.00	25.00– 40.00
Baltimore, Md. (Del. according to quantity)	15.50	22.00– 50.00
Camden & Trenton, N. J.	17.00	.....
Chicago District "Haydite"	14.00	.....
Columbus, Ohio	16.00	17.00
El Paso, Tex.—Klinker	10.00	.....
Ensley, Ala. ("Slagtex")	14.00	.....
Eugene, Ore.	25.00	35.00– 75.00
Forest Park, Ill.	.....	37.00
Friesland, Wis.	22.00	32.00
Longview, Wash.*	15.00	22.50– 65.00
Los Angeles, Calif.	12.50	.....
Milwaukee, Wis.	14.00	20.00– 50.00
Mt. Pleasant, N. Y.	.....	14.00– 23.00
Omaha, Neb.	18.00	30.00– 40.00
Pasadena, Calif.	10.00	.....
Philadelphia, Penn.	15.50	.....
Portland, Ore.	15.00	27.50–112.00
Mantel brick—100.00–150.00		
Prairie du Chien, Wis.	14.00	22.50
Rapid City, S. D.	18.00	30.00– 40.00
Waco, Texas	16.50	32.50–125.00
Watertown, N. Y.	20.00	35.00
Westmoreland Wharves, Penn.	14.75	20.00
Winnipeg, Man.	14.00	22.00
Yakima, Wash.	22.50	.....

*40% off List.

Stone-Tile Hollow Brick

Prices are net per thousand f.o.b. plant.

	No. 4	No. 6	No. 8
Albany, N. Y.*†	40.00	60.00	70.00
Asheville, N. C.	35.00	50.00	60.00
Atlanta, Ga.	26.50	45.00	53.00
Brownsville, Tex.	.....	53.00	62.50
Brunswick, Me.†	40.00	60.00	80.00
Charlotte, N. C.	35.00	45.00	60.00
De Land, Fla.	30.00	50.00	60.00
Farmingdale, N. Y.	37.50	50.00	60.00
Houston, Tex.	35.00	45.00	60.00
Jackson, Miss.	45.00	55.00	65.00
Klamath Falls, Ore.	65.00	75.00	85.00
Longview, Wash.	.....	55.00	64.00
Los Angeles, Calif.	29.00	39.00	45.00
Mattituck, N. Y.	45.00	55.00	65.00
Medford, Ore.	50.00	55.00	70.00
Memphis, Tenn.	50.00	55.00	65.00
Mineola, N. Y.	45.00	50.00	60.00
Nashville, Tenn.	30.00	49.00	57.00
New Orleans, La.	35.00	45.00	60.00
Norfolk, Va.	35.00	50.00	65.00
Passaic, N. J.	35.00	50.00	65.00
Patchogue, N. Y.	.....	60.00	70.00
Pawtucket, R. I.	35.00	55.00	75.00
Safford, Ariz.	32.50	48.75	65.00
Salem, Mass.	40.00	60.00	75.00
San Antonio, Tex.	37.00	46.00	60.00
San Diego, Calif.	35.00	44.00	52.50

Prices are for standard sizes—No. 4, size 3½x4x12 in.; No. 6, size 3½x6x12 in.; No. 8, size 3½x8x12 in. *Delivered on job. †10% disc.

Wholesale Prices of Slate

Prices given are f.o.b. at producing point or nearest shipping point

Slate Flour

Pen Argyl, Penn.—Screened, 200 mesh (94-96% thru 300 mesh), $7.00 per ton in paper bags.

Slate Granules

Esmont, Va.—Blue, $7.50 per ton.
Pen Argyl, Penn.—Blue-black, 6.50 per ton.
Granville, N. Y.—Red, green and black, $7.50 per ton.

Roofing Slate

Prices per square—Standard thickness.

City or shipping point:	3/16-in.	¼-in.	⅜-in.	½-in.	¾-in.	1-in.
Buckingham, Oxford, gray	13.88	19.44	24.99	29.44	34.44	45.55
Bangor, Penn.—No. 1 clear	10.50–14.50	24.50	29.00	33.50	44.50	55.60
No. 1 ribbon	9.00–10.25	20.00	24.50	29.00	40.00	51.25
Gen. mediums	9.50–11.25	.....	.....	.....	.....	.....
No. 2 ribbon	6.75– 7.25	.....	.....	.....	.....	.....
No. 1 Albion clear	7.25–10.50	16.00	23.00	27.00	37.00	46.00
Albion mediums	8.00– 9.00	.....	.....	.....	.....	.....
Chapman Quarries, Penn.—No. 1	8.50–11.25	(Vari-tone, 12.00–13.00)				
Medium	7.75– 9.00	.....	.....	.....	.....	.....
Hard vein	.....	16.00	23.00	26.00	32.00	40.00
Granville, N. Y.—Sea green, weathering	14.00	24.00	30.00	36.00	48.00	60.00
Semi-weathering, green and gray	15.40	24.00	30.00	36.00	48.00	60.00
Mottled purple and unfading green	21.00	24.00	30.00	36.00	48.00	60.00
Red	27.50	33.50	40.00	47.50	62.50	77.50
Monson, Maine	19.80	24.00	.....	.....	.....	.....
Pen Argyl, Penn.*						
Graduated slate (blue)	.....	16.00	23.00	27.00	37.00	46.00
Graduated slate (grey)	.....	18.00	25.00	29.00	39.00	48.00
Color-tone	11.50–12.50; Vari-tone, 12.00–13.00; Cathedral gray, 14.00–15.00					
No. 1 clear (smooth text)	7.25–10.50; No. 1 clear (rough text), 8.25–9.50					
Albion-Bangor medium	8.00–9.00; No. 2 clear, 8.00–9.00; No. 1 ribbon, 8.00–8.50					
Slatedale and Slatington, Penn.—						
Genuine Franklin	11.25	22.00	26.00	30.00	40.00	50.00
Blue Mountain No. 1	10.50	22.00	26.00	30.00	40.00	50.00
Blue Mountain No. 1 clear	9.50	18.00	22.00	26.00	36.00	46.00
Blue Mountain No. 2 clear	8.00	18.00	22.00	26.00	36.00	46.00

(a) Prices are for standard preferred sizes (standard 3/16-in. slates), smaller sizes sell for lower prices.
(b) Prices other than 3/16-in. thickness include nail holes.
(c) Prices for punching nail holes, in standard thickness slates, vary from 50c to $1.25 per square.
*Unfading grey, 10.50–12.50; textural, 12.00–15.00; 10% disc. to roofer; 10%–8⅓% to wholesaler.

Cement Drain Tile

Graettinger, Iowa.—Drain tile, per foot: 5-in., .04½; 6-in., .05½; 8-in., .09; 10-in., .12½; 12-in., .17½; 15-in., .35; 18-in., .50; 20-in., .60; 24-in., 1.00; 30-in., 1.35; 36-in.	2.00
Longview, Wash.—Drain tile, per foot: 3-in., .05; 4-in., .06; 6-in., .10; 8-in., .15; 10-in.	.20
Olivia and Mankato, Minn.—Cement drain tile, per ton	8.00
Tacoma, Wash.—Drain tile, per 100 ft.	
3-in.	4.00
4-in.	5.00
6-in.	7.50
8-in.	10.00
Waukesha, Wis.—Drain tile, per ton	8.00

Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted

Culvert and Sewer	4 in.	6 in.	8-in.	10 in.	12 in.	15-in.	18 in.	20 in.	22 in.	24 in.	27 in.	30 in.	36 in.	42 in.	48 in.	54 in.	60 in.
Detroit, Mich. (c)																	
Sewer	.10	.12	.22	.30	.40	.60	.90	1.20	.....	1.75	2.00	2.50	3.30	4.50	5.75	6.50	8.00
Culvert	.....	.....	.....	.....	.95	1.25	1.60	.....	.....	2.25	2.50	3.00	3.50	5.00	6.50	8.00	10.00
Grand Rapids, Mich. (b)	.....	.....	.....	.60	.70	.90	1.20	.....	.....	1.80	2.10	2.35	3.50	4.00	5.60	6.90	7.85
Houston, Texas	.....	.19	.28	.43	.55½	.90	1.30	.....	1.70†	2.20	.....	.....	.....	.....	.....	.....	.....
Indianapolis, Ind. (a)	.....	.....	.....	.75	.85	.90	1.15	.....	.....	1.60	.....	2.50	.....	.....	.....	.....	.....
Mankato, Minn. (b)	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.50	1.75	2.50	3.25	4.25	.....	.....	.....
Newark, N. J.							6 in. to 24 in., 18.00 per ton										
Norfolk, Neb. (b)	.....	.....	.....	.90	1.00	1.13	1.42	.....	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Paullina, Iowa‡	.....	.....	.....	.....	.....	.....	.....	2.25	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Tiskilwa, Ill. (rein.)	.....	.....	.....	.75	.85	.95	1.20	1.60	.....	2.00	.....	2.75	3.40	.....	6.50	.....	10.00
Tacoma, Wash.	.15	.18	.22½	.30	.40	.55	.85	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wahoo, Neb. (b)	.....	.....	.....	.....	.85½	.....	1.14	.....	.....	1.81	.....	2.47	3.42	4.13	5.63	6.49	7.31
Yakima, Wash.	.....	.....	.....	.....	.....	.....	1.42	.....	.....	2.11	.....	2.75	3.58	4.62	6.14	6.96	7.78

(a) 24-in. lengths. (b) Reinforced (c) Delivered on job: 5% discount, 10th of month. †21-in. diameter. ‡Price per 2-ft. length.

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

Marbelite Corporation of America

A Remarkable Concrete Specialties Organization

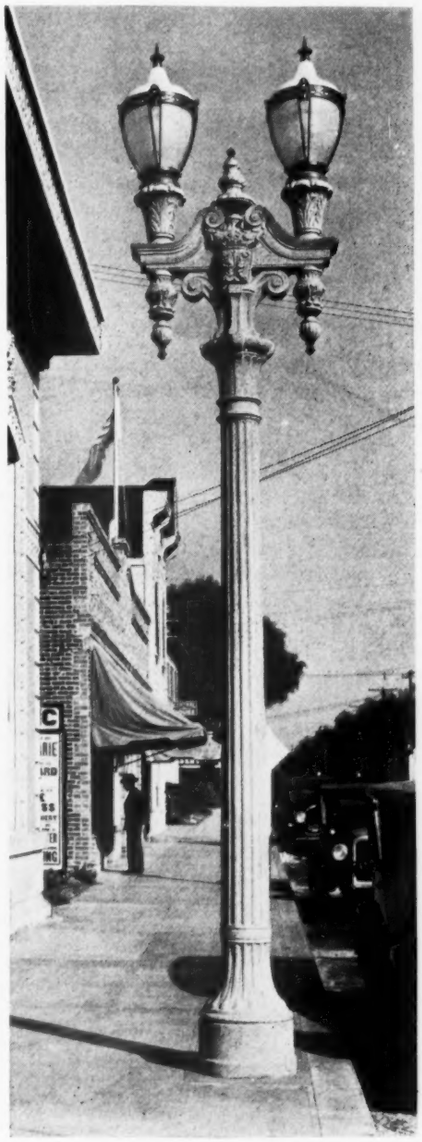
ANYONE who has visited southern California in the past few years and toured over its excellent highways and driven through the many beautiful boulevards that every city there of any size has, is immediately impressed by the artistic street-lighting standards of reinforced-concrete, that for literally thousands of miles flank these drives, standards of such intricate and architecturally beautiful designs that home owners are indeed fortunate to have property abutting such streets.

The Marbelite Corporation of America started production of street-lighting standards in a modest way in 1912, and through a sound sales policy backed by a meritorious product has grown to a $1,000,000 corporation with no outstanding bond issues, owning what perhaps is one of the largest concrete specialty plants in the United States, and distributing its products to some 65 cities in California, some of which are 500 miles distant from the point of production. It has also extended its operations into Midwestern territory by building and operating a concrete lighting standard plant at Waukegan, Ill.

The Marbelite standards are noteworthy in several respects. For their manufacture a special mix and aggregate has been developed. A local coarse high silica sand and ordinary portland cement are used, to which is added a certain amount of crushed granite that has been carefully sized to approximately ⅛- to ¼-in. mesh. A sufficient amount of the granite aggregate is employed so that after the forms for the standard have been filled and whirled in the centrifugal machine, and after curing and acid treatment the crystalline faces of the granite, which incidentally is high in hornblende, are exposed, giving the face of the finished standard a sparkling and attractive appearance. Not only can granites be added to give this pleasing appearance, but any mineral that would make an attractive and resistant outer face.

Engineering Service Rendered

The Marbelite method of selling is of interest and in essence is based on representatives of the company securing the signatures of property owners along a particular highway asking that the city's governing bodies pass a bill authorizing the erection and installation of these lighting standards. Engineers of the company first make a survey of the streets under consideration, spotting the location of each light standard, make recommendations as to the type or design of post to use, and make a guaranteed estimate as to the cost of the complete installation, so that the property owner knows what the maximum cost will be for his share of the improvement. By guaranteed estimate is meant that the Marbelite Corporation, while not in the contracting business as far as making the complete installation is concerned, does guarantee that the work will not cost over the estimate.



Concrete standards of this type are used in many California boulevards

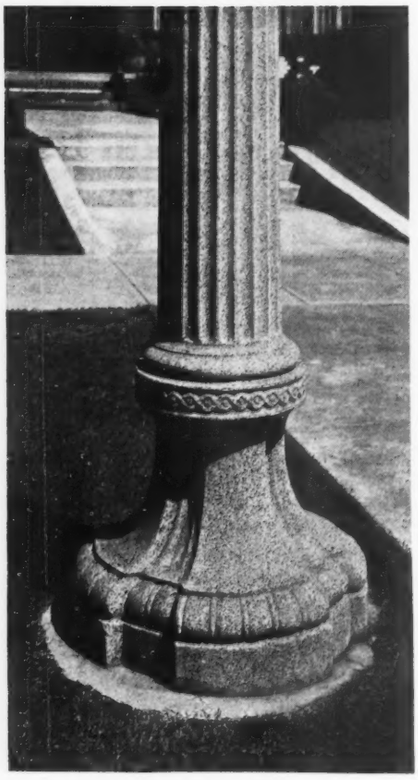
It might be said in passing that about one-third of the total cost of such an installation is for the concrete standard and the balance is for electrical fixtures, globes, wiring and installing, all of which must be sold to the property owner, although the Marbelite Corporation only benefits from the sale of the standard. The cost, complete for lighting a street, will range from $12,000 to $30,000 per mile, depending on the type, length, etc., of the standards supplied. The standards are sold on a delivered basis at their proper location, using for delivery specially designed trucks on which are mounted derricks to facilitate erection.

Practically all of the shipments are made by truck, with deliveries being made by this method over distances of several hundred miles, hauling 26 standards on the truck and trailer.

13 1/2 Miles of Standards on One Highway

One noteworthy street lighting installation made by this company was that of Long Beach Boulevard, one of the main arterial highways connecting Los Angeles and Long Beach. Here 13½ miles of standards were supplied on the two sides of the highway (which incidentally is said to be the largest single concrete slab in the world).

The company guarantees the product for ten years against chipping, cracking or other defects in workmanship, as well as giving to the city buying the standard a three-year insurance policy against breakage from collision.



Details are brought out remarkably by the Marbelite process

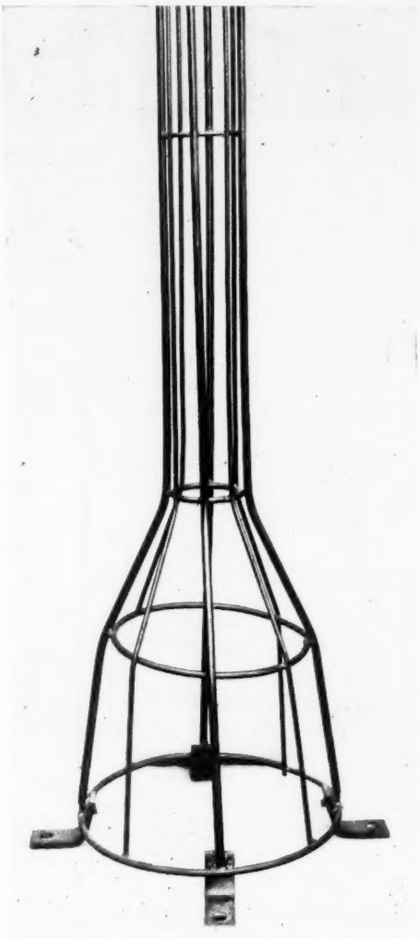
The standards and cross-arms as well as all the decorative features are designed by the company's engineers under the direction of Ralph Waggoner, chief engineer. About 50 different patterns are necessary, out of which upwards of 100 combinations can be made. For the stock patterns, heavy, cast and machined aluminum molds are used, but for installations requiring only a few standards of special design wood forms are used. Aluminum is used, as that metal does not crystallize when subjected to the centrifugal and oscillating action of the specially designed spinning lathes. A 16-ft. standard requires approximately 600 lb. of aluminum, and an insight into the magnitude of this operation can be seen when it is realized that the company has over $500,000 invested in aluminum alone, to which must be added the cost of machine work necessary to secure a finished mold.

Manufacturing Processes Novel

Centrifugally spinning of cast concrete objects is not new to many, but the basic patents owned by the Marbelite Corporation cover not only the centrifugal idea but include an oscillating movement as well, the molds spinning in a horizontal position and in what might be described as an off-center rotation, producing a jarring effect that has a decided tendency to produce a denser and stronger casting. That this effect produces a stronger standard is testified to by the fact that after the mold has spun for 12 minutes at 500 r.p.m., poles up to 51 ft. in height are removed from the molds, still in the horizontal position, and stood on end, green, in the curing shed and supported on their own base without difficulty. A pressure of 350 lb. per sq. in. is obtained on the spinning lathes.

The standards are reinforced with either round or square reinforcing rods ranging from ⅜ in. to ⅞ in., depending on the height of the pole being made, and depending on whether the pole will carry any weight other than its own or not, as, for instance, the combination trolley pole and light standard, which in some instances has to carry a load of 5000 lb. The reinforcement is all fabricated on specially designed jigs in the company's own shop with the circular cross reinforcements welded to the main longitudinal bars, using a method of construction that produces a cage type reinforcement which does not vary over ⅛ in. in each standard. The cage is held in its proper position in the mold by threading the ends of each reinforcing rod and passing the rods through the ends of the molds. By tightening the nuts against the end face of the mold the cage is held rigidly in its proper position during centrifuging. This feature is covered by patents owned by the Marbelite Corporation.

The sand used for aggregate is delivered to the plant by truck and is dumped to a hopper serving a bucket elevator to a Telsmith batcher, where the cement is added and dropped to a 27-cu. ft. Telsmith concrete mixer. The molds are filled in the vertical position by simply allowing the rather

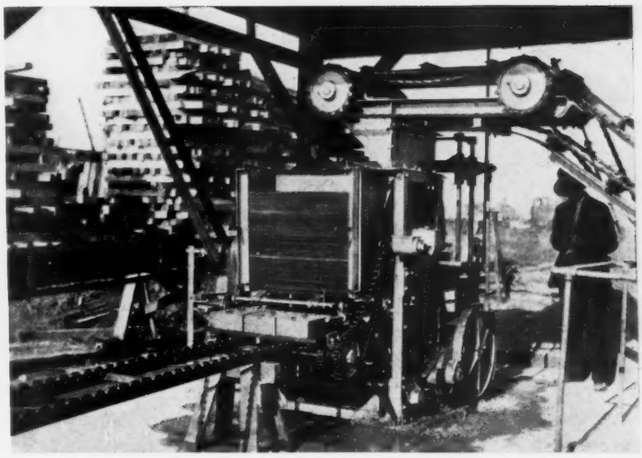


A reinforcing cage for smaller standards where lugs are used for alignment in the molds

A part of the storage yard

Showing the details of the cross arm standards

Concrete mixer (right) and drag conveyor feeding the tile machine

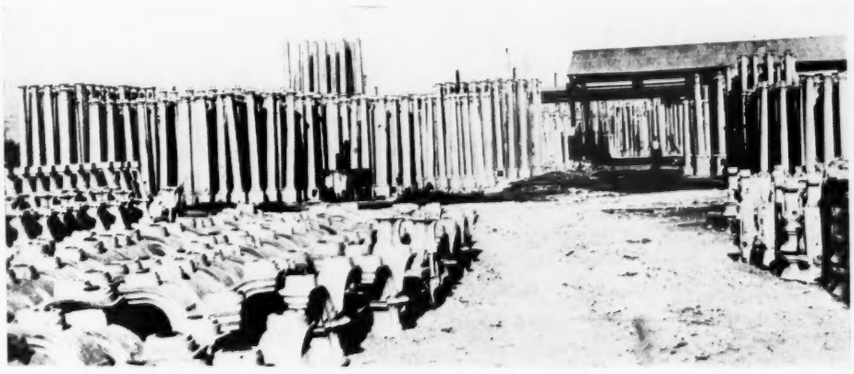


Automatic tile machine operates on the vibrating principle

sloppy mix to run into the end of the mold, which for convenience is suspended in a pit below the mixer. After filling and closing, the mold is elevated out of the pit by an overhead electric crane and placed in the spinning or centrifugal machine. The spinning or centrifuging removes the excess water and produces a hollow standard through which the electric wires can be passed.

The standards are then removed from the molds and placed on end in the curing room, where they are kept moist for 14 days by overhead sprays and not removed from this room to outside storage for 28 days. Before transferring to the storage yard they are immersed in a solution of hydrochloric acid for about three minutes, after which they are thoroughly washed off with clean water and scrubbed with an ordinary fiber brush. No wire brushing is needed or used, as the acid dissolves from the surface just sufficient cement to reveal the crystal faces of the granite, and it is only necessary to wash off this residual acid and any loosened materials.

There are two lathes for spinning the main bodies of the poles, which are so designed and located that they can be used as a single unit for the longer poles. The cross-arms are cast separately and spun in vertical position using a separate single machine, and for small parts a small lathe is used that resembles an ordinary machine lathe. All of these spinning lathes are so designed that a standard of any shape can be made, standards with square bases or combinations of rectangular and columnar designs can be readily made. A feature of interest is that this company is the only one in the field that makes a standard with an enlarged base in which an opening is provided for the electrical equipment, and with this base cast with the pole as a single unit.



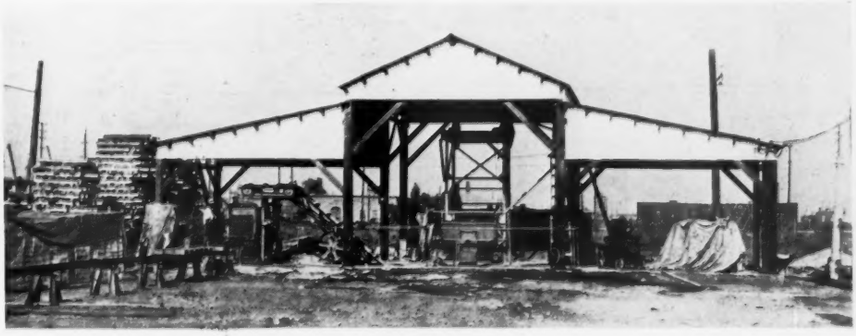
Concrete poles and cross arms in the outside storage yard

Tile Plant

The Marbelite Corporation until this year had confined production entirely to lighting standards, but recently it constructed and placed in operation a tile plant alongside of the main plant. All of the machinery used in this plant with the exception of the mixer and off-bearing conveyors was built in the shops of the company under the supervision of Ralph Waggoner, chief engineer, and without a doubt the installation is one of the neatest and most efficient tile plants that can be found in any locality. The plant at the time of inspecting was producing 8x12-in. tile at the rate of 4000 per 8-hour day, using a total of 21 hp., and at a labor cost of $6 per thousand. These figures speak for themselves as to the efficient design of the plant.

In southern California there seems to be no demand for the 16-in. tile, but the smaller sizes find a ready market. The machine can produce any sized tile at low operating costs as well as lend itself to the manufacture of manhole brick or other special shapes.

The basic patents covering this machine are owned by the Marbelite Corporation and are based on the vibratory principle, using



The Marbelite concrete casting plant; the space at the right is for a second machine

special rubber bearings and a mold with a rubber bottom so designed that the vibration is confined to the mold alone and not imparted to the machine or its foundation. Vibration is effected by an unbalanced pulley.

The machine is almost automatic, requiring one attendant or off-bearer; a single laborer keeps up the supply of pallets and attends to the stacking of the blocks at the end of the conveyor.

Casting Tile

In making the 8x12-in. tile, three units are cast at one time and the mold, after filling, is vibrated a few seconds, and while filling. After that the top of the mold is scraped off and means are provided for automatically feeding the pallets to the machine, moving the rubber-bottomed mold out of the way, and for pressing the tile out of the mold and passing the tile on to the off-bearing conveyor.

The vibrating action is transmitted evenly throughout the molds, which weigh 500 lb. each, and produces a tile of very even density. Tile produced on this machine will in 28 days stand a 2000-lb. test, a strength far in excess of the Los Angeles city ordinance requirements, which stipulate a minimum of 1200 lb.

The coarse sand and cement used are delivered by trucks to a small bin which feeds by gravity to a ½-cu. yd. skip, that bottoms in a shallow pit. The skip is elevated over a short inclined track to a ½-yd. Tuerck mixer, which discharges to a small hopper below. In the bottom of this hopper is a short screw type conveyor that feeds the mixed concrete in a uniform flow to an inclined drag conveyor serving the vibrating machine. The tile after casting pass to a Mathews conveyor and are pushed by hand to the outside storage yard for curing.

This conveyor consists of interchangeable lengths of small channel irons to the sides of which are bolted a series of small rollers roughly 4 in. in diameter, that run on ball bearings. By supporting these conveyor lengths on simple wooden horses the tile can be delivered to any place in the yard. Thirty to forty tile can be easily pushed to their destination by one man, and owing to the true alignment of the ball-bearing carriers the tile do not tend to run off the conveyor.

The tile are cast with a rough top, but, owing to their being piled seven high in the yard, all except the top row have a somewhat even surface from the boards on which the tile are cast. The piles are covered with burlap and kept moist by frequent wetting during the curing period.

The plant as shown in the illustration has at present only a single vibrating machine, but a second unit will be added in the space provided at the right, and the plant is so designed that the single mixer and screw conveyor will serve both vibrating machines.

Ralph Waggoner, chief engineer, Marbelite Corporation, showing one of the new products

Thus by the addition of three more horsepower and the vibrating machine the capacity of the plant can be doubled. The floor space for the entire two units, including all equipment, is approximately 14x60 ft.

It is the intention of the company to place this machine on the market for use of the concrete products industry, and it will be sold on a royalty basis. All of the motors in this plant were supplied by the U. S. Motors Co., Los Angeles.

Office and plant, Marbelite Corp. of America, Los Angeles, Calif.

The shop and factory are of frame construction, covering an area of roughly 300x500 ft., with outside storage space of several acres. The casting plant and yard are liberally supplied with a series of overhead monorails on which are mounted both hand- and electric-operated Yale and Towne chain blocks for handling both the green and cured products.

The company has a large and well-equipped shop for fabricating all the reinforcement necessary in making its product, with ample facilities for manufacturing all the machinery, with the exceptions noted, necessary in connection with the tile plant.

The offices of the Marbelite Corporation are at the plant, located at 3248 Long Beach boulevard. Emerson D. Hall is president of the corporation and H. C. Stewart secretary and treasurer. The company also has a Chicago office located at 232 East Erie street.

Canadian Cement Products Manufacturers Increase in 1928

MANUFACTURERS of cement products in Canada during 1928 were valued at $4,136,955, according to a bulletin issued by the Dominion Bureau of Statistics at Ottawa. This value was the highest ever reported for the industry and was 55% above the total of $2,665,065 reported in 1927.

Ontario with 105 plants and Quebec with 34 together produced more than 90% of the total output in the Dominion. Other establishments were located as follows: Three in each of the provinces of Nova Scotia, New Brunswick and British Columbia; two in Saskatchewan and one in Alberta. These 151 plants employed capital reported at $4,140,543 and furnished work to an average of 1,262 people throughout the year. Payments for salaries and wages amounted to $1,466,508, materials used cost $1,261,653 and the value added by manufacturing was $2,875,302.

Aerial Tramway Transportation

A NEW BOOK "Cutting Material Handling Costs" by C. M. Ballard is an excellent exposition on material transportation through aerial tramways. It compares costs, applications and relative advantages of this system with other haulage methods. The various types of cableways and tramways are described and illustrated in detail.

Mathematical data concerning the erection and installation are given in a readily understood form in the appendix. Power types and applicability as well as towers and structures for the different systems are treated in the section also.

The book, profusely illustrated, was edited by D. C. Sherman, consulting engineer for the Williamsport Wire Rope Co., Chicago, which company published the work.

Sand-Lime Brick Production and Shipments in August

THE following data are compiled from reports received direct from 16 producers of sand-lime brick located in various parts of the United States and Canada. The number of plants reporting is two less than those furnishing statistics for the July estimate published in the August 17 issue. The statistics below may be regarded as representative of the entire industry, the reporting plants having about one-half the production capacity in the United States and Canada.

Production remains about the same as in July, although the total is lower, due to the fact that the number of plants reporting is two less than for the previous month. Rail and truck shipments remain about the same, although stocks on hand increased somewhat, and unfilled orders decreased considerably.

The following are average prices quoted for sand-lime brick in August:

Average Prices for August

Shipping Point	Plant Price	Delivered
Boston, Mass.	$12.00	$16.00
Detroit, Mich.	.....	15.50@16.00
Detroit, Mich.	13.00@14.00	15.00@16.00
Grand Rapids, Mich.	.....	14.00@15.00
Hartford, Conn.	14.00	17.00
Madison, Wis.	12.00@12.50	13.00@14.00
Milwaukee, Wis.	10.50	13.00
Minneapolis, Minn.	8.00	10.00
Mishawaka, Ind.	11.00	.....
Pontiac, Mich.	12.50	15.50
Saginaw, Mich.	12.00	.....
Syracuse, N. Y.	18.00	20.00
Toronto, Canada	12.50	15.00
Winchester, Mass.	.....	16.00

The following statistics are compiled from data received direct from 16 producers in the United States and Canada:

Statistics for July and August

	*July	†August
Production	16,061,000	15,772,000
Shipments (rail)	4,263,000	4,462,000
Shipments (truck)	12,266,000	10,746,000
Stocks	8,854,000	8,879,000
Unfilled orders	14,739,000	9,700,000

*Eighteen plants reporting; incomplete, one plant not reporting stocks on hand and seven not reporting unfilled orders.

†Sixteen plants reporting; incomplete, one plant not reporting stocks on hand and seven plants not reporting unfilled orders.

Notes from Producers

Sand Lime Products Co., Detroit, Mich., advise they are supplying sand-lime brick for the Albert Smith school at Riverview, Mich., and the Wilbur Wright school at Detroit, Mich.

Canadian Sand-Lime Brick Production in 1928

PRODUCTION from the sand-lime brick industry in Canada rose to a new high value during 1928 at $1,112,466. In 1927 the output value for this industry was $939,911 and in 1926 the total stood at $629,672. Production in 1928 included 82,271,000 sand-lime brick worth $1,038,510 as against a production of 72,864,000 valued at $864,911 in 1927 and 50,282,000 at $606,409 in 1926. The balance of the output in each year consisted mainly of hollow building blocks.

During the year under review, eleven plants were operating in Canada, seven of which were located in Ontario, two in Quebec and two in Manitoba. These concerns employed a capital of $1,916,060 and distributed $352,311 in salaries and wages to an average of 270 workmen. Purchased materials cost $322,027 and the value added by manufacturing amounted to $790,439.

See Farm Relief Through Surfaced Market Roads

FARM organization officials and others nationally prominent in advancing farm relief, as well as officials speaking for the motoring public, will meet October 28 to November 1 next, with road-building officials, engineers and contractors, at West Baden Springs, Ind., to devise plans for speeding up improvement of the nation's highway system as a measure of farm relief and the alleviation of traffic congestion on trunk-line highways near great centers of population. Paving of the farm-to-market roads will be the keynote of the conference.

The convention, known as the Eighth Annual Asphalt Paving Conference, will be held under the auspices of the Asphalt Association, New York, and the American Association of Asphalt Paving Technologists.

Dubuque Company's Agstone Storage and Reclaiming System

BECAUSE of the seasonal nature of the agstone market, the Dubuque Stone Products Co., Dubuque, Iowa, puts into storage about 75,000 tons of agricultural limestone every year out of a total yearly production of 100,000 tons.

When the company's new crushing plant was first put into operation, during the summer of 1927, plans for handling this amount of agstone reserve had not been worked out, but early in the following year the company installed a ¾-yd. power drag scraper system to stock it out on a tract of land near the plant and to reclaim it when needed for shipment. The plant was described in the April 28, 1928, issue of ROCK PRODUCTS when this system had just been installed; the views reproduced here, however, show the storage yard after a year and a half of operation.

The storage yard is a tract about 150 ft. wide and 650 ft. long, situated between the Mississippi River and the railroad tracks at the side of the crushing plant. The stone (everything passing an ⅛-in. screen) is carried from the screening plant by a short belt conveyor passing over the railroad tracks, and is discharged to an "initial pile" from which the scraper, a Sauerman ¾-yd. "Crescent" outfit, distributes it over the storage area. In reclaiming, the scraper brings the stone back to a point beside the switch tracks and it is loaded into railroad cars by a clamshell crane. When the maximum amount of stone is in storage, it is piled to a height of about 40 ft.

The scraper bucket operates between a headpost 30 ft. high, erected behind the initial pile, and two 40-ft. backposts at the outer end of the area. The tail block guiding the operating cables is hung either from one of these backposts or from a bridle cable stretched between them. The power unit is a Sauerman electric scraper hoist, set in a small hoist house at one side of the headpost.

The scraper outfit on its average length of haul has a maximum capacity of 75 tons per hour, and the operating cost is said to be about 1½ cents per ton for each operation (stocking out and reclaiming).

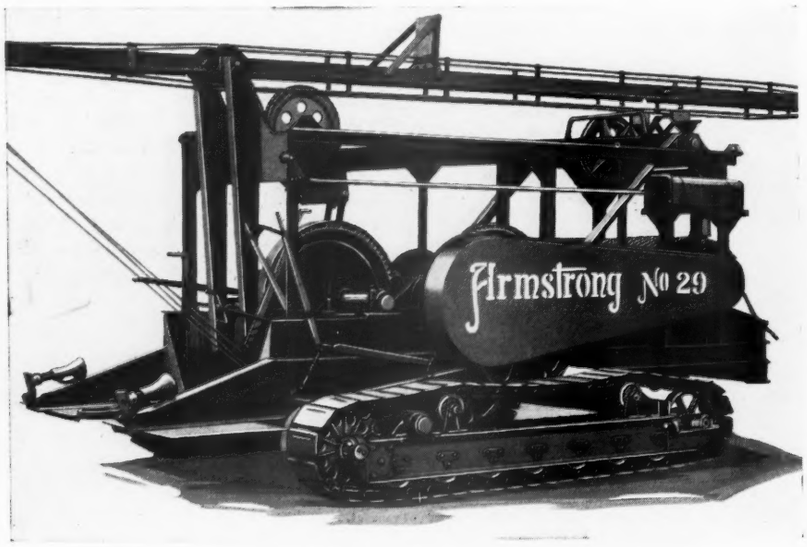
Agstone storage and reclaiming system at the Dubuque Stone Products Co., Dubuque, Iowa

New Machinery and Equipment

All Steel Blast Hole Drill

GREATER strength and drilling capacity coupled with more moving ability are some of the features claimed for the new Armstrong No. 29 all steel blast hole drill.

There is not a bolt or rivet in either the frame or derrick construction. Every beam, upright, cross bar, brace and truss is electric arc welded in position.



New all-steel blast hole drill is mounted on apron treads

The derrick, designed especially for wire rope, is equipped with the Armstrong wire line shock absorber, constructed of a series of rubber discs. This provides a cushion 12 in. thick. The bull reel has a capacity to spool 1000 ft. of ¾-in. steel cable.

The derrick is constructed of channel steel with truss rods, both front and back, supported by stiff leg braces anchored to the four corners of the frame, and to both the top and center of derrick, a feature which permits moving the machine over rough ground with the derrick raised and tools in position, the manufacturers state. Full length alligator treads, on which the machine is mounted, are similar in style to the mounting used under power shovels, cranes and other heavy machinery. The apron treads provide 22.2 sq. ft of bearing area and each tread is 11 ft. 3 in. long. The machine can be turned around in a space no greater than its own length, according to the makers.

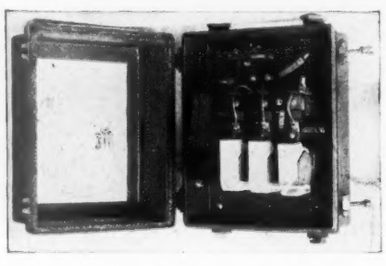
The machinery and its arrangement are adapted to direct gas engine or electric drive, and all clutches, shafts, bearings and gears are oversize. Power is applied to the drilling motion through heavy steel machine cut gears.

All gears, pinions, pulleys, belt, sprockets and chains are covered with metal guards, to protect them from the elements, and also from the hazards of blasting.

This type drill working in an open pit iron mine on the Mesaba range, Minnesota, is said to have drilled 630 ft. of 6-in. hole in 27½ hours' working time, or an average of almost 23 ft. per hour.

Dust-Tight Linestarters

THE WESTINGHOUSE Electric and Manufacturing Co., East Pittsburgh, Penn., announces the development of dust-tight and weather proof linestarters. They are remote controlled, non-reversing, across-the-line type magnetic starters for single phase and polyphase squirrel-cage induction motors. These starters are claimed especially adaptable for use in coke plants, cement mills, steel mills, and other places where a dust-tight starter is very desirable.



Remote controlled, dust-tight linestarter

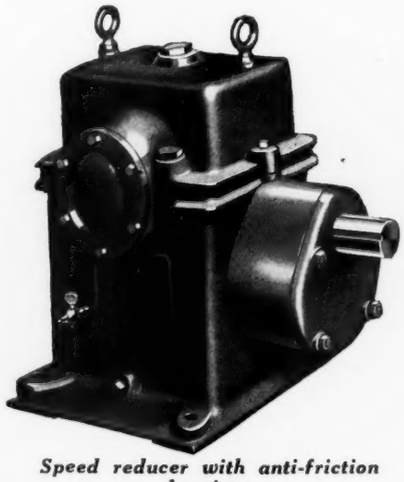
A cast iron cabinet is used with a gasket seal on the door. The conduit is brought in through the top and bottom in threaded openings, so as to make a dust-tight connection. These features make the cabinet dust-proof and waterproof, the manufacturers say. All of these linestarters are equipped with the deion grid type arc quencher.

To prevent the operator from breaking the seal whenever the motor is put back in service after an overload, the two small size linestarters are equipped with an automatic reset thermal overload relay. This relay has interchangeable heaters, and accessible calibration lever, and quick make and break contacts.

The dust-tight linestarter is now available in three sizes up to 50 hp.

New Worm Gear Speed Reducer

FOOTE Bros. Gear and Machine Co., Chicago, has recently developed a new anti-friction worm gear speed reducer known as the HGX type. This is made as a single reduction unit with right angle drive which has a maximum ratio of 58 to 1; the double reduction provides for all ratios over 58 to 1 and up to 5000 to 1 but the shafts are parallel.



Speed reducer with anti-friction bearings

The maximum motor speed which can be applied to the high speed shaft of this unit is 4000 r.p.m. The new reducer is a fully enclosed, self lubricating unit having anti-friction bearings, bronze worm gear and nickel steel carbonized, hardened, ground and polished worm.

New 6-Cylinder Gas Engine

CONTINENTAL MOTORS CORP. announces an overhead valve, removable cylinder sleeve, six cylinder gasoline engine, the model 20Z of 150 hp. with a 5¼ in. bore and 6 in. stroke which will be displayed at the A. E. R. A. Convention to be held in Atlantic City, September 28th to October 4th, in conjunction with its already established line of overhead valve series for lighter bus service.

Lightweight Pneumatic Rock Drill

A NEW, Model 11 rock drill is now being produced by the Gardner-Denver Co., Denver, Colo. This is a light all-purpose drill weighing about 50 lb. that can be used for wet or dry drilling. It has an excellent drilling speed, the manufacturers say, and gives an unusually good daily footage without undue strain upon the operator, due to smoothness of operation. It is rotated by a rifle bar and rachet.

This new drill may be mounted for light drifting, chanelling with a quarry bar, used on a tripod, or for miscellaneous work where a light mounted drill is desired. It takes steel ranging from ⅞- to 1-in. In ordinary operation this drill is said to keep the hole clean and free from cuttings by means of the sending of a strong air current through the drill steel. When drilling unusually deep holes, a special blowing device can be turned on. A single oil reservoir in the cylinder lubricates all moving parts or air line oilers also can be used on it.

All the parts of this new drill are claimed to be well balanced and made of the best alloy steel and drop forgings. The handle grips are of tire stock rubber that are held by a heavy through bolt. The steel puller is of simple design and is operated by hand and the part which engages in the collar of the steel may be replaced when worn. The pivot is lubricated.

New Air Compressors Equipped with Roller Bearings

A NEW LINE of air compressors, employing Timken roller bearings on the main crank shaft journals, recently has been announced by the Worthington Pump and Machinery Corp., Harrison, N. J. This is the Worthington single horizontal straight line series. Capacity ranges from 100 to 300 cu. ft. per min., operating at moderate speeds.

These compressors are equipped with oil rings which deflect the surplus oil and return it to the crank case; oil-tight crankcase enclosure and feather valves.

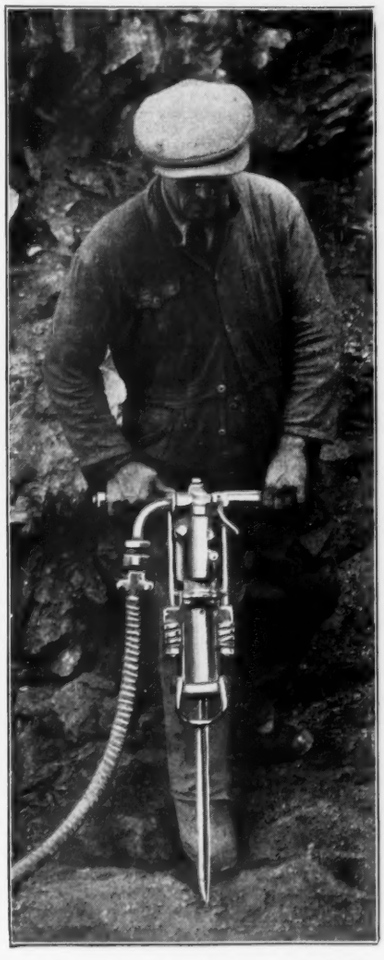
Regulations may be by an automatic starter and pressure switch mounted on the motor, stopping and starting it to control the air pressure between definite limits. Or a pressure regulator may be attached to the compressor inlet valves, holding them open to maintain constant air pressure. Compressors with the latter type of unloader, which bypasses the air back to suction, are claimed never to overheat when unloading.

These compressors can be furnished with ball bearing idlers for short belt drive; with Texrope drives, using V-type ropes; or a synchronous motor may be directly mounted on the compressor crank shaft, thus eliminating transmission mechanism.

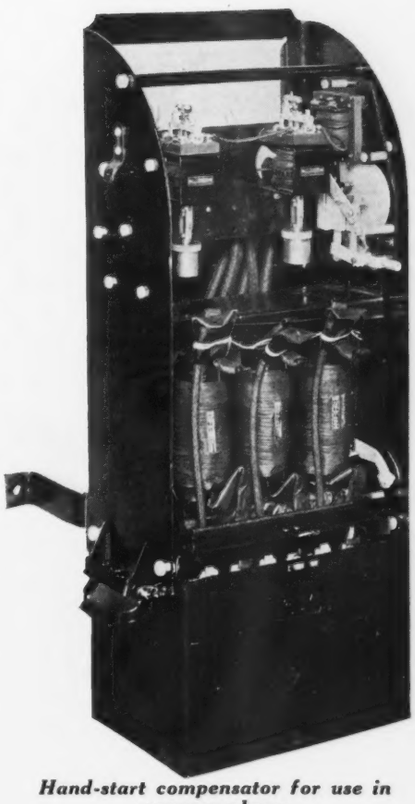
Compensators Designed for Use in Gaseous Atmospheres

TO MEET THE DEMAND for a hand-starting compensator for use in places where there are explosive gases or gasoline fumes, the General Electric Company of Schenectady, N. Y., has placed on the market such a device, bearing the designation CR-1034-N-52. This is a modification of standard equipment so designed as to eliminate exposed arching. The starting switch on this device is oil-immersed. In addition, the usual push-button tripping device is not included in the equipment but, instead, a standard time-delay undervoltage attachment and dashpot relays are used with Cooper Hewitt mercury tubes substituted for the usual contact tips of the dashpot relays. As a result of this arrangement, exposed sparking or arcing at contacts is eliminated.

The new compensator is available for use with 15 to 125 hp., 25 to 60 cycles, 2- or 3-phase electric motors.



Lightweight pneumatic rock drill



Hand-start compensator for use in gaseous places

Big Shovel Uses Copper-Steel Castings

THE NEW 20 cu. yd. electric shovel built by the Marion Steam Shovel Co., Marion, Ohio, has but little change in general design over the 12 cu. yd. model built in 1928. Approximately half the material used in the large shovel is a special copper alloy steel casting and the remainder, ordinary open-hearth structural steel. The copper-steel alloy is known as Kinnear 8-30 and made in the Marion Company's plant. All the castings are heat treated.

Certain parts such as pinions, dipper front teeth and crawler rods, subject to hard wear are made of high manganese steel. Shaftings are of forged steel and also of chrome-vanadium steel. The lower frame of the 20 cu. yd machine is of structural steel with alloy steel castings at the center and four corners.

Small Excavators Now Equipped with Six Cylinder Engines

THE General Excavator Co., Marion, O., manufacturers of convertible half-yard shovels, is now powering all machines with a standard make six-cylinder gasoline engine.

News of All the Industry

Incorporations

Glass City Builders' Supply Co., Jeannette, Penn., filed voluntary petition of bankruptcy.

American Sand and Material Co., St. Louis, Mo. Leo H. Hummert, 3505 Gravis St.

Virginia-Carolina Granite Co., Inc., Danville, Va., $100,000. T. S. Williamson.

Canadian Rock Products Co., Ltd., Montreal, Que., $55,000.

Schoenfeld Quarries, Inc., San Antonio, Tex., $175,000. Charles M. Schoenfeld, M. H. Haring and E. G. Hendrix.

Livingston Sand and Gravel Sales Co., Newark, N. J., 1250 shares common. Edwin G. Adams, Newark, N. J.

Michigan Artificial Stone Co., Detroit, Mich., $50,000. To deal in artificial stone, cement and sand products.

Concrete Products Manufacturing Co., Fayetteville, N. C.; capital stock $10,000; subscribed stock $1500. D. R. Kelly, Lottie Kelly, M. F. Shuford, Fayetteville.

Wisconsin Black Granite Co., Wausau, Wis., 100 shares, par value $100. C. Ninneman, H. Ninneman, V. Callaway and H. Hoffman.

Howard Concrete Products Co., Seattle, Wash., $13,000. R. O. Howard, J. F. Collins and C. A. Robinson.

Wisconsin Lannon Stone Co., Milwaukee, Wis., increased capital to 2500 shares preferred at $100 each and 5250 shares common no par value stock.

Builders Concrete Co., Tulsa, Okla., $75,000. J. T. Lynch, 1712 South Quincy St., Tulsa, and J. M. Chandler.

Loxon Tile Co. of Chicago, Maywood, Ill., $50,000 preferred and 5000 shares common stock, no par value. James A. Hall, C. E. Cherry and Locy Young.

Quarries

E. M. Bittinger's stone plant, Hanover, Penn., was damaged recently by a fire which began in the operating room. The loss is estimated at $4000.

Indiana Limestone Co.'s sales for August were the largest in two years, according to President A. E. Dickinson. The company booked orders for 2600 carloads of stone.

Portland, Ore. Pending permission from the city council, bids for a new rock crusher for the city paving plant will be called for by the city purchasing agent, Frank Coffinberry.

Tateville, Ky. The state quarry here is now in operation. It is understood that the highway department has abandoned the idea of placing prisoners at work in the quarry.

Premier Granite Quarries, Inc., La Grange, Tex., will develop a new 250-acre quarry property at Llano, Tex., to cost over $60,000, including machinery. L. W. Stoltz is vice-president.

Wisconsin Black Granite Co., Wausau, Wis., recently organized, has already begun operations with a crew of ten men, according to H. R. Hoffman, business manager of the company.

McGilvray-Raymond Corp., San Francisco, Calif., has been formed with the merging of the McGilvray Granite Co., Raymond Granite Co. and the California Granite Co.

Dayton Limestone Co., Dayton, Ohio, recently opened its quarry on the Union road west of Dayton. The company is under the management of A. D. Angelo and G. E. Short.

Pulaski County, Arkansas—A rock crusher, with a daily capacity of 400 tons, will be installed here on the county farm and operated by prisoners. Crushed rock from the machine will be placed on roads northwest of Little Rock.

Rogers County Lime and Rock Co. has already started the crushing of rock at its new plant located several miles out of Oolagah, Okla. The cost of the plant is about $70,000 and it has a capacity of 40 cars of crushed rock per day.

Western Lime and Cement Co., Milwaukee, Wis., has purchased 80 acres of land, known as the Vondrachek farm, in Cato, Wis., at a cost of $30,000. The land contains extensive limestone deposits which will be developed.

Atlas Rock Co., Miami, Fla., has leased large quarries near Red road and Southwest Fourteenth street on a royalty basis, and will soon construct a 2½-mile railroad to connect with the Seaboard Air Line.

Le Conte Marble Co.'s quarry near Ebenezer, Tenn., and its plant and equipment on Scottish Pike, it is reported, were sold recently to M. C. Monday for $51,000 to satisfy claim for $64,000 loaned to the Le Conte company by Mr. Monday.

Indiana Limestone Co., Bedford, Ind., is supplying stone for the new $17,000,000 department of commerce building and the new internal revenue building at Washington, D. C. For the former 1280 cars of stone will be used and for the latter more than 500 cars.

Wisconsin Granite Co., Chicago, Ill., will discontinue crushing operations at its Redgranite, Wis., quarry for an indefinite period. According to Wm. Wiske, superintendent, the plant has several thousand tons of crushed stone on hand. The crusher at the plant, damaged recently when a kerosene torch overturned, will not be put in repair this season.

Sand and Gravel

L. C. Feeley, Cody, Wyo., has purchased the gravel pit and equipment of John Gibson, located on the Upper Sage creek.

Cooley Gravel Co., Chillicothe, Mo., has received a $2200 contract for the graveling of West Fourth street.

Northern Pacific Railway Co. donated 50 cars of gravel to the city of Superior, Wis., for the graveling of Stinson road from South Superior to East End.

S. and L. Gravel Co., Marion, Ind., has been awarded gravel contract by the state highway department for the new highway known as State Road No. 21 between Marion and Converse.

American Material Corp.'s new gravel plant near Williamsdale, Ohio, will be operating at full capacity by October 1, it is reported. The company also established a sand plant and a slag crushing plant last April.

American Aggregates Corp., Greenville, Ohio, has a new sand and gravel distributing unit under construction at Indianapolis, Ind. The capacity of the plant will be approximately 2000 tons of gravel and sand a day. C. Gray is district manager.

Oliver King Sand and Lime Co., Knoxville, Tenn., is shipping six carloads of sand each week to Elizabethton for construction of buildings at the Glanzstoff rayon plant. The company is also supplying sand for the Aluminum company's dam project at Calderwood.

Stein Sand and Gravel Co., Banning, Calif., has been awarded contract for supplying Columbia Glass Co., Los Angeles, with from 6000 to 12,000 tons of silica sand annually for a period of four years. The company also has contract for 18,000 tons of Banning rock to be delivered to Colburn and Sons at March Field.

Hersey, Mich. Gravel plants here are reported to be reaching new production peaks for the season. The Hersey Gravel Co. is working 50 men in two 10-hour shifts, while the Crescent Gravel Co. is putting in its best year, having produced 115,000 tons of washed material thus far. Improvements are being made at both plants.

Cement

Pennsylvania-Dixie Cement Corp., Richard City, Tenn., plant has received an order for approximately 250,000 bbl. of cement as a result of the huge expansion program planned by the Aluminum Co. of America in East Tennessee.

Pacific Coast Cement Co., Seattle, Wash., celebrated the shipment of its one millionth sack of cement by appropriate ceremonies in which leading figures in the civic and industrial life of the city participated. The plant began operating in February of this year.

Calbert-Baker Lime and Cement Co., Phoenix, Ariz., is constructing a warehouse, 40x150 ft., at Twelfth and Jackson Sts., Phoenix. F. W. Calvert, for many years connected with the Colorado Portland Cement Co., and R. V. Baker of Phoenix are associated in the new company.

Superior Portland Cement Co., Concrete, Wash., was visited recently by a party of eight girls from the office of the Pioneer Sand and Gravel Co., Seattle. Kenneth S. Childs and Jack Loughary of the Seattle office of the cement company were the official guides, and the ladies also visited the quarry, the Baker river dam and other places of interest in the vicinity.

Agricultural Limestone

Illinois used 740,000 tons of agricultural limestone last year, the largest amount used by any state in the Union, according to reports.

Independent Gravel Co., Hannibal, Mo., furnished the limestone for a special agstone train for the farmers of Clark County, Ill.

Gaffney, S. C. O. H. Stanard, representative of the American Limestone Co., Knoxville, Tenn., completed arrangement for a co-operative shipment of five carloads of agricultural limestone, totaling about 200 tons, for a group of 12 Cherokee county farmers.

R. G. Morris of the C. & E. I. testing train has prepared a very practical and interesting exhibit on agricultural limestone. It is planned to have the train stop for several hours at each of 28 southern Illinois towns and give a practical course on the use of limestone for soil fertility.

Howard County, Mo. A trainload of agricultural limestone was unloaded here recently. The train was made up of 14 cars, each purchaser receiving from one to three cars. Arrangements for running the train were made by Dan E. Miller, county extension agent; B. B. Bransetetter of the Blackwater Stone Co., and officials of the M-K-T railroad.

Centerville Limestone Co., Centerville, Ohio, reports a rapidly increasing business in limestone for agricultural purposes. The company produces, in addition to building stone and crushed stone, a finely pulverized, high calcium carbonate limestone. The Southwestern Ohio Experiment Station at Germantown has used this limestone with good results.

C. A. Swenn and F. M. Mills have secured an option on a limestone deposit at Cascade, Idaho. The deposit is the property of the Hurley Creek Mining and Milling Co. of Cascade, and is located favorably for supplying agricultural lime to the farmers of the entire southern Idaho territory. A number of progressive farmers here have already placed orders with the company.

Cement Products

Midatlantic Concrete Pipe and Products Corp., Waynesboro, Va., is to erect a $30,000 plant. John E. Johnson, 3011 Buckingham St., Norfolk, Va., is general manager.

Miscellaneous Rock Products

D. W. Stewart is reported to be developing a large kaolin deposit near Bennettsville, S. C.

Keystone Phosphate Co., Montpelier, Idaho, has a development program lined up for phosphate mining and refining at its holdings west of Paris, Idaho. A shipment of new machinery for the company arrived from Pittsburgh recently. The company's phosphate deposits at Paris, Idaho, were recently examined by C. H. Skinner, Philadelphia capitalist.

Idaho American Phosphate Co., Nampa, Idaho, has completed plans for a milling plant in Nampa for grinding and preparing phosphate rock for fertilizer. The mill will have a capacity of about 10,000 tons of finished product yearly and the estimated cost is $30,000.

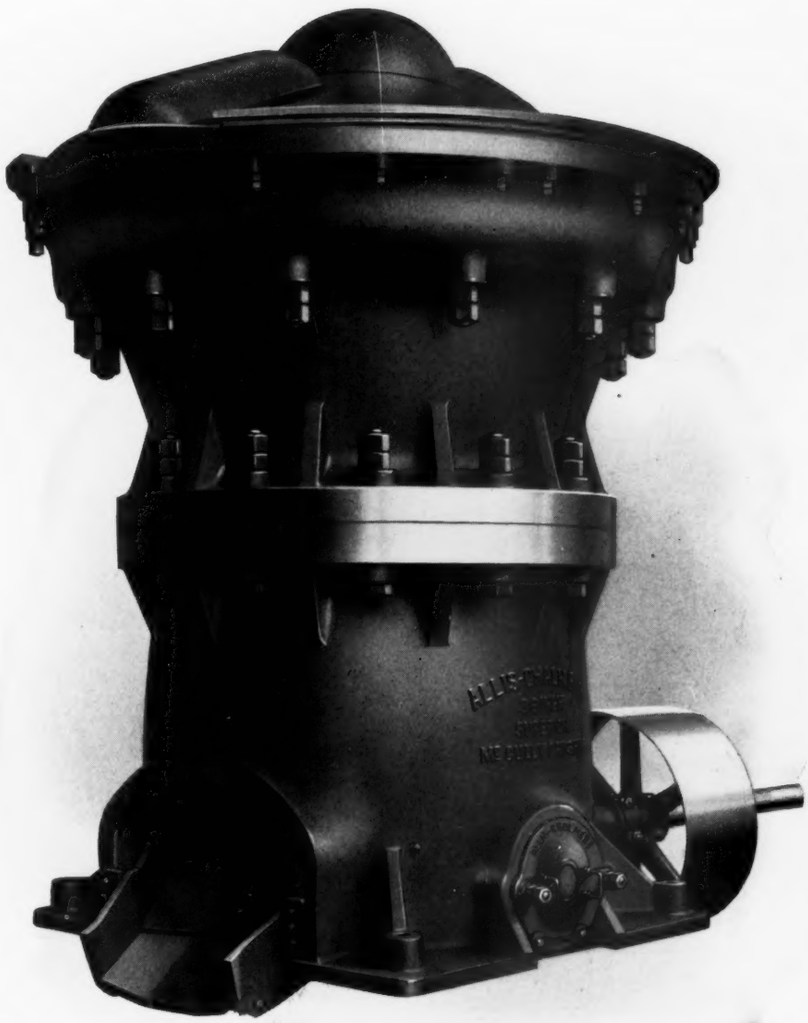
Obituaries

John E. Goans, 37, employe of the Knoxville Sand and Lime Co., Knoxville, Tenn., died September 1, as the result of an accident in stepping off the end of the Straw Plains bridge of the Southern railway and falling a distance of 60 feet to the base of a pier.

Anthony Zalatroff, plant foreman of the Wisconsin Granite Co., Redgranite, Wis., died from injuries sustained when the gasoline torch with which he was working back-fired and set fire to his clothing.

Allis-Chalmers *Superior-McCully Crushers*

Points of Superiority



Rigid spider hub, due to close coupling of shaft bearings, maintains perfect alignment of bearings and reduces strain on spider.

Eccentric is placed directly below the head. This greatly increases the strength of the shaft; eliminates shaft deflection and consequent breakage and results in greatly increased crushing capacity.

Improved type of dust collar excludes all dirt from the eccentric bearing.

Gear and pinion are of cast steel with cut teeth flooded with oil, insuring smooth operation and long life.

Main frame bored at the factory for all three hands of drive.

Lubrication of eccentric bearings and gears is effected by means of a geared oil pump located in the oil chamber in the bottom plate. This positive pump results in a continuous flow of oil from the pump to the top of the eccentric, and the flooding of the gears with oil.

Superior McCully crushers are built and serviced by Allis-Chalmers Mfg. Co., a pioneer in the development of gyratory crushers and today one of the world's leading manufacturers of crushing, grinding and screening equipment. A complete line of gyratory crushers from small laboratory and sampling types to giant 60-in. machines is built by this company. Write for complete information.

ALLIS-CHALMERS MANUFACTURING CO.

MILWAUKEE, WISCONSIN.

District Sales Offices in all Principal Cities

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Personals

Paul W. Litchfield, president of the Goodyear Tire and Rubber Co., Akron, Ohio, has started on a business trip to South America.

C. E. Cox, the new general superintendent of the United States Gypsum Co.'s plant at Lancaster, Ohio, was given a cordial welcome by the "Gladhand" committee of the Lancaster Chamber of Commerce.

J. L. Grindell, Platteville, Wis., made an extended visit to the stone quarries of Wisconsin recently. His first stop was at Montello, famous for its granite, and from there he visited the quarries of Wausau, Berlin, Marinette and Amberg.

D. Karl Miers, secretary of the Bloomington Limestone Co., Bloomington, Ind., addressed the Indianapolis Kiwanis Club recently. Mr. Miers discussed the limestone deposits of the state and the preparation of limestone for commercial use.

P. T. Redfern, formerly manager of the Chicago office of the Mead-Morrison Manufacturing Co., has been appointed general sales manager of the Byers Machine Co., Ravenna, Ohio. **L. T. McGuire** will continue as assistant sales manager in charge of the sales office.

Frank Cordes of Lewis Foundry and Machine Co., which company was absorbed by the Blaw-Knox Co., Pittsburgh, Penn., has been made a vice-president of Blaw-Knox. He remains as president of Lewis Foundry and Machine Co. and becomes a director of Blaw-Knox and vice-chairman of the board. **Albert C. Lehman,** president of Blaw-Knox, becomes chairman of the board of all the subsidiary companies.

Manufacturers

Smith and Smith, Akron, Ohio, has moved to 455 Chestnut Blvd., Cuyahoga Falls, Ohio.

Allis-Chalmers Mfg. Co., Milwaukee, Wis., has moved its Toledo office from 819 Ohio Building to 711-12 Second National Bank Building.

Hill Clutch Machine and Foundry Co., Cleveland, Ohio, has opened a New York office at 30 Church St., Room 1525, New York City, in charge of Arthur L. Whiteside.

Byers Machine Co., Ravenna, Ohio, has added the following distributors to its sales organization: National Supply Co., Toledo, Ohio, and Mertes Machinery Co., Milwaukee, Wis.

Chain Belt Co., Milwaukee, Wis., has moved its Houston office to larger quarters at 1310 Second National Bank Bldg., from 1000 Marine Bank Bldg. Russell G. Davis is manager.

Smith Engineering Works, Milwaukee, Wis., is planning an extension to its plant to be 150 ft. long by 90 ft. wide. It is expected that the building will be completed by September 15.

Ohio Malleable Iron Co., Columbus, Ohio, a subsidiary of the Jeffrey Mfg. Co., announces the election of W. A. Grieves as secretary, and H. Supp, Jr., as treasurer. J. F. Davidson has been elected to the board of directors.

Merco Nordstrom Valve Co., San Francisco, Cal., has enlarged its plant at Oakland, Cal. Manufacturing space has been practically doubled, and special engineering quarters have also been provided.

Besser Mfg. Co., Alpena, Mich., has opened a new Eastern sales office and parts station at 16 Treat Place, Newark, N. J. John H. Thompson is Eastern representative at this office, and he is assisted by Will Caldwell and James Walsh.

Union Steel Casting Co., Pittsburgh, Penn., has been merged with the Blaw-Knox Co., Pittsburgh, Penn., as announced in a letter to stockholders from J. P. Allen, president of the Union Steel Casting Co.

Babcox and Wilcox Co., New York City, builders of boilers, superheaters and mechanical stokers, will complete the second unit of its new plant at Augusta, Ga., for the production of refractory cements and plastics.

Wagner Electric Corp., St. Louis, Mo., announces that Ralph R. Rugheimer is now a member of the Atlanta branch sales office and F. C. Hosimer has been transferred from the St. Louis home office to the Chicago branch sales office.

General Refractories Co., Philadelphia, Penn., recently adopted the new policy of selling their Grefco Chrome High Temperature Cement and Standard Silica Bonding Cement through dealers in industrial centers throughout the country.

Kentucky Wagon Manufacturing Co., Louisville, Ky., announce that they have purchased the manufacturing rights for the Badger "Giant" double cylinder grain and roughage mill from the Badger Equipment Co. and will begin manufacture of the machine at once at their Louisville plant.

Prest-O-Lite Co., New York City, is constructing a large acetylene plant at Tampa, Fla. This is the second manufacturing project affiliated with the same corporation to open a branch in Tampa within a year. Linde Air Products Corp., also a unit of the Union Carbide and Carbon Co., has been manufacturing oxygen at Tampa for about a year.

Hercules Motors Corp., Canton, Ohio, has received an order from the Soviet government of Russia for 1700 heavy-duty Hercules engines of the six-cylinder type. This order, which represents an expenditure by the Soviet of over three-quarters of a million dollars, is the second of its character within the year.

Westinghouse Electric and Mfg. Co., East Pittsburgh, Penn., at its recent directors' meeting elected Harold Smith vice-president of the company. Mr. Smith entered the legal department of the Westinghouse company in 1919, and was appointed general solicitor in 1926, which position he has held up until the present appointment.

Jeffrey Mfg. Co., Columbus, Ohio, announces that C. W. Miller has resigned as treasurer of the company, but will continue as a member of the board of directors. H. Supp, Jr., formerly credit manager, will succeed Mr. Miller as treasurer. J. X. Farrar, formerly assistant purchasing agent, has been appointed credit manager succeeding Mr. Supp.

Combustion Engineering Corp., New York City, announces the discontinuance of its New England agency representation with Schumaker-Santry Co. of Boston and the establishment of a Boston district office at 100 Arlington St. J. J. Brady is district manager of the new office and M. E. Yeager is sales engineer.

E. I. du Pont de Nemours and Co., Inc., Wilmington, Del., announce the election of three new members to its executive committee, namely, J. Thompson Brown, general manager of the explosive department; Jasper E. Crane, chairman of the board of directors of the Du Pont Ammonia Corp., and W. F. Harrington, general manager of the dyestuffs department.

Continental Motors Corp., Detroit, Mich., has organized a subsidiary company, Continental Aircraft Engine Co., to manufacture and develop aircraft engines. W. R. Angell is president of the new company, which will utilize the facilities of the parent company. Production will be carried on at the Detroit plant, located near the Detroit City Airport. The company has also established Pacific Coast headquarters, including a general sales office and exhibition hall, at 1855 Industrial St., Los Angeles, Calif.

Link-Belt Co., Chicago, Ill., announce the resignation of F. B. Caldwell, vice-president of the Chicago plant, on account of ill-health. W. C. Carter, formerly vice-president in general charge of production, will assume the duties of vice-president and general manager of the Chicago plant. E. J. Burnell, formerly manager of the Pittsburgh office, has been appointed sales manager of the western division, with headquarters at the Chicago plant. Nels Davis succeeds Mr. Burnell as manager of the Pittsburgh office.

General Electric Company, Schenectady, N. Y., has appointed **E. D. Spicer,** formerly superintendent of the refrigeration department, as assistant manager of the Schenectady works. Mr. Spicer has been connected with the company in various capacities since 1924. **Darius E. Peck, assistant** manager of the law department of the company since 1920, was elected vice-president and general counsel, following the retirement of Allen H. Jackson, who held that position since 1922. Mr. Peck has been connected with the legal department of the company since 1913.

B. F. Goodrich Co.'s directors have approved the consolidation of the company with the Hood Rubber Co. on the basis of an exchange of one share of Goodrich common for each two shares of Hood common. The plan of consolidation provides that Goodrich shall acquire the assets and business of the Hood company through a subsidiary company which will assume the Hood company's debts, and that all the Hood company's preferred and special stocks shall be paid off in cash at various call dates at their respective redemption prices. The Hood business will be operated as a separate unit.

Trade Literature

Power Shovels. Broadside on the Thew "Lorain" excavators. THEW SHOVEL CO., Lorain, Ohio.

Kiln Lining. Booklet setting forth advantages of Arcofrax high aluminum brick for lining the hot zones of kilns. GENERAL REFRACTORIES CO., Philadelphia, Penn.

Nikrome Steel. Folder on this heat treated alloy steel which has proven very successful for a wide range of heavy duty applications. JOSEPH T. RYERSON & SON, INC., Chicago, Ill.

Nickel Cast Iron. Bulletins Nos. 201-A and 207 giving data and new applications of nickel and nickel-chromium cast iron. INTERNATIONAL NICKEL CO., New York City.

Building Costs. Bulletin No. 12 giving data on the design and construction and cost estimate of a five-story abrasive building. MORTON C. TUTTLE CO., Boston, Mass.

Large Vertical Motors. Bulletin **No. 159** covering all types of large vertical motors in ratings of 1½ to 30-hp. WAGNER ELECTRIC CORP., St. Louis, Mo.

Water Wheels. Bulletin No. W-204 featuring the Ford Motor Co. plant at Hamilton, Ohio, in which were installed water wheels manufactured by JAMES LEFFEL AND CO., Springfield, Ohio.

Rolled Zinc. Compilation of data on the different forms of rolled zinc. The fabrication, testing methods, physical properties, uses, etc., of zinc are given. NEW JERSEY ZINC CO., New York City.

Motor Control Equipment. Oil-immersed motor starters and automatic compensators for various purposes are described in a broadside issued by THE ELECTRIC CONTROLLER AND MFG. CO., Cleveland, Ohio.

Concrete Products. Three decades of progress in the manufacture of concrete units is the subject of the August issue of Besser Tampings," the interesting periodical of the BESSER MFG. CO., ALPENA, MICH.

Placing the Detonator. How to obtain best results by properly placing the detonator in a charge of explosives is outlined in detail by Paul F. Lewis in the July issue of the Service Bulletin. E. DU PONT DE NEMOURS & CO., INC., Wilmington, Del.

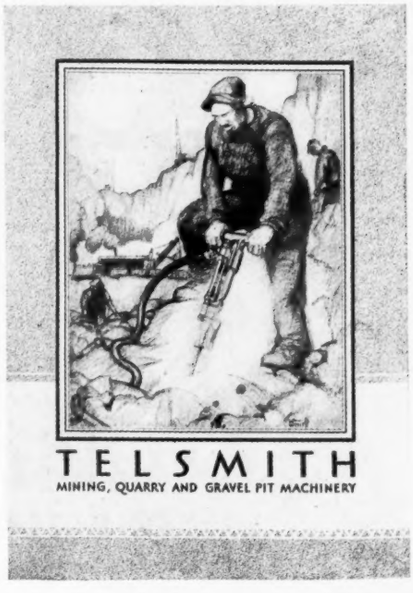
Chains, Elevators, Conveyors. New Rex **330** Catalog and Engineering Data Book, containing 800 pages of information on chains and chain drives, elevators and conveyors, traveling water screens and construction mahinery. CHAIN BELT CO., Milwaukee, Wis.

Handling Wet Concrete. "New Applications and Set-Ups" is the title of a 28-page book on the handling of wet concrete with belt conveyors on construction jobs. Completely illustrated. BARBER-GREENE CO., Aurora, Ill.

Network Protectors and Relays. Bulletin 1837 entitled "Recent Developments in Automatic Network Protectors and Relays." Completely illustrated. WESTINGHOUSE ELECTRIC AND MFG. CO., East Pittsburgh, Penn.

Speedcranes, Shovels, Draglines and Trenches. New catalogue, completely illustrated, outlining advanced features and engineering construction of Moore speedcranes, shovels, draglines and trenches. MANITOWOC ENGINEERING WORKS, Man-

Centrifugal Compressors and Blowers. New catalog, designated as catalog **F,** covering complete line of De Laval centrifugal blowers and compressors, with a concise presentation of the mechanics of the compression of gases and physical properties of industrial gases. DE LAVAL STEAM TURBINE CO., Trenton, N. J.

Hydraulic Hoist. Bulletin describing and listing applications of use of new model "A" hydraulic hand hoist for motor trucks. Several interesting views of the Wood-type W-10 bodies for delivering individual sizes and mixed orders of various grades of sand and stone are shown. WOOD HYDRAULIC HOIST AND BODY CO., Detroit, Mich.

Mining, Quarry and Gravel Pit Machinery. Bulletin No. 266F covering Telsmith screens, washers, conveyors, bin gates, etc. Completely illustrated. SMITH ENGINEERING WORKS, Milwaukee, Wis.